THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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(J. A. BERLY'S).

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THE STATUS QUESTION.

THE problem of raising the status of the engineering profession, which has been kept so prominently before the eyes of engineers during recent years, is in no danger of falling into oblivion. Only the other day a paper on this subject was read before the Society of Engineers, by Mr. G. Allan Thomas, who gained the first of five annual prizes offered by the secretary of that society, Mr. A. S. E. Ackermann, with a view to promoting reform and hastening the recognition of the profession as being on an equality with the older professions of law and medicine. The author advocates co-operative action on the part of the three leading engineering institutions for the purposes of restricting the title of "engineer" to those who are duly qualified by training and experience to act as such, and of obtaining statutory powers similar to those possessed by the governing bodies of the sister professions—a proposal very much on the lines that we put forward some months ago.

Mr. Thomas would appoint the "Central Organising Body," or, as we should prefer to call it, the Engineering Council, from the Institutions of Civil, Mechanical and Electrical Engineers only, but it must be admitted that these by no means include within their scope the whole of the branches of engineering, and in this respect the profession is at a serious disadvantage compared with the legal and medical professions; the functions of an "engineer" cover a very wide field, from sewerage and waterworks to railway construction and power supply, from shipbuilding to telegraphy, and it is clear that the task of reconciling and marshalling in line the diverse forces of these heterogeneous and incoherent interests will be a gigantic one. Nevertheless, the need is pressing, and that there is a powerful and growing current of opinion in this direction, not only here, but also abroad, is certain.

As things are, anyone can call himself an engineer, without incurring the least risk of exposure or punishment if he is not possessed of adequate qualifications; provided one can secure commissions, there is no difficulty in obtaining the services of skilled assistants to carry them out, for qualified men in subordinate positions are only too plentiful. The man with a talent for commercial organisation, therefore, may succeed, while the man of high scientific and professional attainments is left out in the cold. Instances will readily occur to the mind of anyone familiar with engineering circles. Unfortunately, important works are not seldom placed in the hands of men who have neither the ability to carry them out successfully, nor the acumen to surround themselves with a competent staff, and the result is disaster, for which, however, the "engineer" is not legally responsible. Much public money has thus been wasted, and unmerited discredit cast upon the whole profession.

Another unfortunate result of the present state of things is that even the most highly-qualified engineer, duly appointed to

a position of high responsibility, is often denied the respect which is his due. When one calls in the advice of a doctor or a lawyer, one feels that it must be followed, even if it run counter to one's own views or desires; but when an engineer is consulted, his opinion does not carry equal weight, and his authority is not unquestioned. Nothing is more remarkable than the manner in which non-technical officials, who would not dream of pronouncing upon a point of law or medicine, show no hesitation in expressing their views upon engineering matters, and overriding the opinions of competent engineers. This phase of the subject is, perhaps, most strongly marked in the case of the public services, such as the Post Office and other Governmental departments and—as electrical engineers will readily agree—in municipal undertakings.

It has been argued that the Institution of Civil Engineers, by the wide scope of its articles, embraces all branches of engineering, and is in itself qualified to provide the necessary stamp of merit. It cannot be denied that this, the premier Institution, has led the way, by requiring candidates for membership to prove themselves duly qualified by examination and otherwise, towards the attainment of a high standard of scientific training, experience, and general education and culture; and it has urged upon its members the desirability of adhering to the recognised code of etiquette. But we do not think that, as at present constituted and governed, the Institution of Civil Engineers can be accepted either as fully representative of engineering or as a model organisation. Affiliation of the other important bodies to the Institution of Civil Engineers would go far towards removing the former objection, but cannot be suggested unless they also agree to institute due trial and strict examination into the qualifications and experience of their new members, and there will still remain the difficult question of the status of those who have already been admitted to membership. It is doubtful, too, whether the younger institutions would be prepared or could be induced to part with any fraction of their independence, in view of their great size and importance, and, possibly, some reluctance to admit the superior standing of the elder body.

On the other hand, the Institution of Civil Engineers has always exhibited a somewhat haughty temperament and has held itself aloof from all proposals towards co-operation, though it has offered generous hospitality to its juniors. Even when proposals for reform and progress have emanated from within its own ranks it has usually turned a deaf ear to them. The most recent attempt was that of April last, when an influential committee submitted to the Council the results of a plebiscite of the members, proving the existence of a strong feeling in favour of reform. Yet the Council merely acknowledged without comment the receipt of the letter conveying the result of the inquiry. Its attitude, as expressed in the report to the last annual general meeting, is that of leaving to the public the recognition of the professional status of members of the Institution, and it deprecates any attempt to regulate the acts of engineers who do not belong to it. A code of professional conduct was submitted to the meeting, but the adoption of a scale of fees was regarded as impracticable.

It will be seen that the Council, at any rate, is disposed to withdraw within its shell, and to do nothing. Yet, surely, if the claim of the Institution to be the head of the engineering profession is to be allowed, this attitude is an impossible one. The call for reform is insistent, and cannot be denied. If the Civil Engineers will not move, action must come from other quarters—and any such proceeding will necessarily detract from the high standing of the parent body.

SUCTION GAS AS A POWER FOR PIONEERS.

We are by no means anxious to stir up the embers of the fierce fires of controversy which have raged in times past regarding the use and abuse of the suction-gas plant. Whatever its merits and demerits, they are by now patent to all observers, so far as conditions in this country are concerned, owing to the fact that the erstwhile "revolution in power" has now settled down to an ordinary every-day existence. The object of these notes is to point out that, whatever may be the decision of engineers as regards the usefulness of the suction-gas plant in Great Britain, it does not follow that the power problem of the world is solved.

We are led to these remarks by an extract we have received, through the courtesy of an Australian correspondent, from the pages of *The Lone Hand*. This magazine, which is of a character calculated to appeal to a large class of general readers in the Antipodes, contains in its September issue an article by C. A. Jeffries, entitled "The Suction Gas Fiasco." The interesting point to us is not so much the graphic recital of the early English failures, or the able and lucid summary of the engineering pros and cons of the question, as the assertion with which the article concludes. This reads as follows:—"To the knowledge of the writer, three Sydney firms, four Melbourne houses, and one Brisbane manufactory have installed suction or producer gas plants, found them wanting, and replaced them, or are in the act of doing so, with either electric power or gas from the civic authorities or gas companies. So, with these experiences of suction and producer gas, Australian manufacturers will do well to keep clear of what on paper can be made to look a very alluring proposition." The sting of this article assuredly lies in its tail.

Now there is no doubt in the minds of most engineers that, given on the one hand an adequate system of centralised power at average rates, and on the other an independent suction gas plant with its possibilities of breakdown, the manufacturer who chooses the latter must seek protection behind the Scriptural injunction which deters us from calling our brother "Fool." But what about the pioneer of civilisation who has established a factory several hundred miles up country, where the municipal authority, if there were one, would rather set its Sanitary Department to chase the mobile mosquito than inaugurate an Electric Lighting and Power Committee? There are many thousands of industrial concerns, all vital to the world's progress, situated in such a position that only a slender line of rails provides them with the necessaries of life, and with an

outlet for their finished product. Freight is heavy, labour is cheap, and the plant which will give them the most power out of a pound of anthracite, independent of any question of depreciation, steadiness of running, labour charges, and other complexities which enter into the short-radius fight at home, will win the day. In such locations suction gas plants have surely a sphere.

Again, in many pioneering power plants of this nature the question of transport into place is a serious one. When one hears of boats destined for the Upper Nyanza being completely built and fitted at home, taken apart, numbered, and sectionalised so that each piece can be carried between two natives for many miles through rough country, one realises the difficulty of engineering operations in the lone lands of the world. The suction gas producer plant is light, portable, and capable of sub-division. It is not difficult to put together with comparatively unskilled labour, and when in place it is not subjected to severe internal pressures testing the excellence of the work. The gas engine itself is a comparatively small and portable affair. No expensive foundations are necessary, so that the plant can be put up with comparatively little precaution on soft ground, and, granted the supply of suitable fuel, there is very little doubt as to its superiority to a cranky old steam engine and a superannuated loco-type boiler. Wanderers in the backwoods will bear us out when we say that the choice of firms or individuals of small capital operating in such places does not usually lie between a high-priced modern steam plant and a low-priced but capricious gas plant, but rather between the latter and an absolutely cranky, vicious, but dirt-cheap second-hand combination of alleged steam engine and boiler. Under the circumstances the gas plant scores.

The matter is of great interest to electrical engineers, and is therefore discussed in these columns. The sale of electrical plant, from a dynamo to a metal-filament lamp, depends upon the presence in the first instance of mechanical power; water power is not often available in sufficient quantity or steadiness. Wind power is used considerably for pumping water, &c., but the driving of dynamos at a steady speed by this means would make even a Salt Lake City Mormon "admire." The suction-gas plant, unless the above remarks can be contradicted, comes next on the list of practical accessibility and efficiency, and we therefore suggest consideration of its merits from an entirely new point of view by electrical exporters when the question of power for pioneers arises.

The Imperial Press Conference.

At the Imperial Conference held in June last, a Cable Sub-committee was formed of leading representatives of the Press of Great Britain and Greater Britain, to open negotiations with cable companies for Press rate reductions. The result was an agreement by the Government-owned Pacific Cable Board to reduce their Press rate to Australia and New Zealand from 1s. a word to 9d. a word, and this was closely followed by reductions of about 25 per cent. on the Eastern Telegraph Co.'s lines to India, Australia, New Zealand and South Africa, practically falling into line with the Pacific Cable reductions. There has been submitted for the approval of the Board of Trade the memorandum and articles of a new organisation, registered in the name of the "Empire Press Union," with which the Cable Sub-committee will be merged. A secretary has been appointed, and Mr. Harry E. Brittain, the popular hon. secretary of the Conference, will act in the same capacity, and help in the organisation of the permanent body.

Dominions and over-sea States will form their own committees and enrol members, and every newspaper of the Empire will be eligible, and may nominate one member.

The object of the Empire Press Union is to carry on the work begun by the Conference, and it now remains to be seen what will be the result of its endeavours to obtain for the newspapers throughout the Empire a better and fuller news service. During the Conference the Canadian section seemed desirous of obtaining lower rates between this country and Canada, and of having news of purely British origin and flavour, and went so far as to suggest the laying of a cable to provide for its realisation if the Atlantic cable companies did not reduce their rates.

"Wireless" was to be a valuable lever to reduce charges across the Atlantic, but so far, notwithstanding various protestations and Mr. Marconi's statement at a meeting of the Conference, and the pious hope, if not belief, of others at the Conference, we have not yet been favoured with a demonstration that would lead to the belief that it is possible to rely on this system of communication, year in and year out, for continuous working at any speed for from 12 to 24 hours daily, between the United Kingdom and Canada. This must have been more or less in the minds of members of the Conference towards the finish, as another plan—viz., that of laying a cable to Canada at their own cost, or preferably that of the Government—was freely mentioned.

It will, therefore, be interesting to note the next step taken, because, if the Atlantic companies remain obdurate, there will be no other plan left but cable laying and working. Will the Government or the Committee rise to this, as nothing material has yet been gained in the reduction of rates on Government lines and the consequent meeting of them on competing lines? The rate of 9d. is probably divided up as follows: 5d. to the Atlantic and land-line companies, and 4d. to the Government lines beyond Canada; and the Government are apparently not doing much more in the way of cheap rates than the companies.

MODERN TENDENCIES IN STEAM TURBINE DESIGN.

By A. P. CHALKLEY, B.Sc.

Practically no radical alteration in the design of steam turbines has taken place in the last five years, and each manufacturer has continued more or less on the same lines as previously, making various improvements in detail but no change in principle. In the last 12 months, however, there have been signs of great activity among even the most conservative of turbine builders, who in each particular case seem to have been roused to a sense of the possibilities of advancement, and to a realisation that types of turbines other than their own may possess advantages so considerable as to lead to their general adoption, unless further improvements are effected in the design of the original type.

That the question is becoming one of importance is evidenced by the fact that the two most prominent firms engaged in the manufacture of Parsons turbines in this country are now both working upon designs embodying great modifications from the usual type, and one of these firms has already placed a new machine on the market. There is, further, the ominous news that the British Admiralty, which has hitherto plumped solidly for the Parsons turbine, has recently ordered three destroyers to be equipped with Curtis turbines, while one will probably be

engined with a type manufactured by the Parsons firm, in which the impulse and reaction principles are combined in a somewhat original manner.

Keen observation is not necessary to see that neither the Parsons nor the Curtis turbine (and all others may be considered for the moment as offshoots of these two) is the ideal machine which can be expected to maintain its sway for any length of time. The former has gained such a foothold in this country that to speak of it as anything but perfect seems to be almost a heresy. But it has its weak points, and the evolution of the turbine can only be carried out by recognising them and not by neglecting them while another type is brought forward elsewhere to capture the none too abundant trade.

The chief weakness of the Parsons machine lies in the high-pressure end. The steam after passing through the double beat valve has a pressure of, say, 100 lb. per sq. in. when it enters the first row of guide blades, and hence its specific volume is low and also its actual volume. This necessitates that the annular space between the spindle and the cylinder, whose sectional area is rather more than the circumference of the spindle multiplied by the blade height, should be small. The spindle diameter cannot be reduced below a certain limit for several reasons, the chief being that the resultant velocity of the steam is dependent on it, so that the only remedy is to have short blades. This causes two troubles. The clearance between the cylinder blades and the spindle and between the spindle blades and the cylinder can never be less than 0·02 in., and even with this clearance the danger of stripping, especially with superheated steam, is quite serious. If the blades are only ½ in. high, as is frequently the case for a 500 or 750-KW. turbine, the area of the leakage path through which steam can pass without doing any work is more than 4 per cent. of the whole steam inlet area—that is to say, nearly 4 per cent. of the available power in the steam may be wasted. Of course, it is hardly fair to say that the whole of this is irretrievably lost, as it is more than probable that some of its energy is returned in the next stage; but, in any case, it does not do its work in the most efficient manner.

At the low-pressure end the case is different, particularly in the third and last expansion. The clearances need not be very much greater—at any rate, not more than 0·03 to 0·035 in. for the same machine (500 to 750 KW.)—while the blades would be from about 3½ in. in the first row to 6 in. in the last row of the final expansion. The loss in efficiency by leakage is, therefore, practically negligible, and the danger of stripping is much diminished—first, from the reason that the temperature is much less, and, secondly, because the clearances are greater. In fact, the low-pressure end of a Parsons turbine—that is, from the point where the steam is at atmospheric pressure to the exhaust, is about as ideal a machine from a theoretical and practical point of view as could well be expected; and this is proved by the splendid results obtained by Parsons exhaust steam turbines, both as regards reliability of running and lowness of steam consumption.

The Curtis turbine, on the other hand, suffers from defects which do not exist in the Parsons type, but possesses advantages at the high pressure end, which are of enormous value. The first set of nozzles through which the steam passes do not extend round the whole of the periphery at the inlet end, and are usually only about one quarter of the area of the annular space between the wheels and the cylinder, which can, therefore, be much larger than in the Parsons machine. On expanding through the nozzles the steam, of course, drops its pressure very much more than in the first row of guide blades in the reaction turbine, and the volume is consequently large, permitting the use of long blades, which, for the machine previously mentioned, would be perhaps 1¼ to 1½ in. high, instead of ½ in. Furthermore, the full steam pressure comes on no part of the turbine casing except the steam chest, and the temperature throughout is correspondingly lower, even with the use of superheat, so that the liability of the cylinder to distortion is greatly minimised.

The only part of a Curtis turbine where leakage of steam is probable is between the spindle and the fixed diaphragms which extend down to it, and it is here that this turbine is at a disadvantage. The clearance has to be necessarily small, and if seizure takes place, the effect is far more serious than the stripping of blades in the reaction turbine, for the reason that the spindle is usually bent when such an accident occurs. Also, while in the latter case the blades may easily touch the cylinder casing or the spindle without being stripped, it is more than probable that the slightest contact in the Curtis turbine will cause the maximum disaster. This danger is greater as the wheels become larger and heavier, that is to say, as the low pressure end is approached; and in view of this, the Fore River Shipbuilding Co., of Quincy, U.S.A., the constructors of practically all the Curtis machinery for the United States Navy, have recently made a great alteration in the design of their turbines. They have now adopted 14 stages instead of seven, which has hitherto been universal in marine work, and the last eight stages are on one drum, thus transferring the leakage space to a similar position to that in the Parsons turbine—between the drum and the interior of the diaphragms—and adding considerably to its reliability.

Summarising the above facts, the result which *must* finally be brought about is the combination of the two systems in the points where they show their greatest efficiency. The deduction is obvious—so obvious that one might wonder

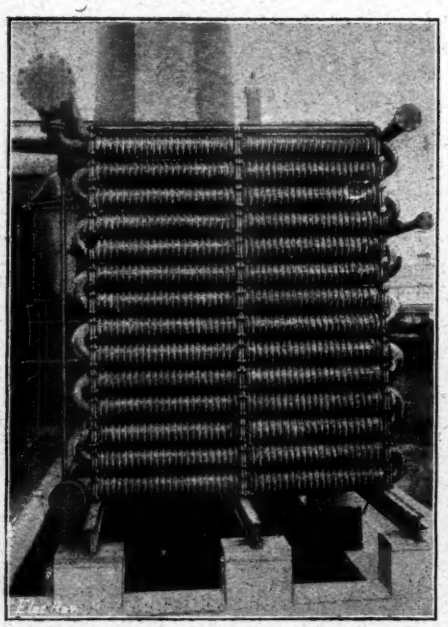


FIG. 1.—END VIEW.

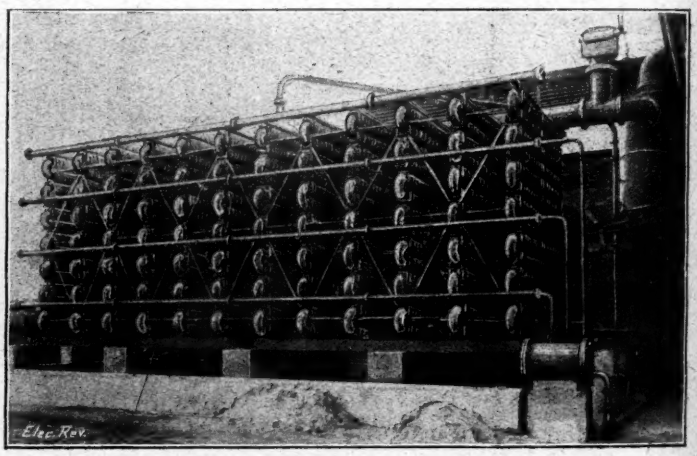


FIG. 2.—SIDE VIEW.

EVAPORATIVE CONDENSERS AT BRIDLINGTON (see opposite page).

why it had never been put into practice, if the difficulties of construction and the high cost of experimenting in these competitive times were not realised. A turbine in which the high-pressure end is of the Curtis type (in principle), and the low-pressure end of the Parsons type, seems to contain all the elements necessary for the greatest success. The exact meaning of high-pressure and low-pressure ends must be determined by experiment, but as a rough estimate it may be said that the machine should be of the Curtis type from the stop-valve pressure to atmospheric pressure, and of the reaction type down to exhaust pressure; that is, so that the work accomplished in the two portions should be approximately the same. There is but little doubt that a turbine built on these lines would far exceed in efficiency and reliability all the others at present in existence, and it is indeed satisfactory to learn that the pioneer in steam turbine manufacture in this country is now engaged in experimenting with such a machine, and a few years hence we may expect to see its general adoption.

EVAPORATIVE CONDENSERS.

In view of the article on this subject contributed by Mr. E. K. Scott in our issue of September 24th, Mr. A. J. Beckett, borough electrical engineer, Bridlington, has kindly forwarded the following particulars of his plant:—

The condenser (figs. 1 and 2, p. 684) consists of 12 coils of Ledward's corrugated pipes arranged in one group connected together by a common exhaust main at the top and a vapour pipe at the bottom. At three intermediate points the water is drained away from the coils and led through horizontal pipes to one end of the condenser, where it passes through a sealing chamber, which is connected to the wet pump. Each drainage section is controlled by a valve, so that the hot well temperature may be varied as desired, and a higher temperature obtained than that corresponding to the vacuum.

The air pumps are of the Edwards three-throw type motor driven, 10 in. diameter × 10 in. stroke with a separate rotary wet pump.

The air pumps and the circulating pump, which is also motor-driven, also the switchboard for the three motors, are installed in a section of the boiler house.

The whole of the condensed steam passes from the wet pump to the gauge tank of a Lea recorder. This tank is placed close to the hot well from which the feed pumps draw, while the recorder proper is fixed in the engine room. A pipe is connected between the tank and the recorder to maintain the same level throughout, and by this means an exact record is kept of the steam consumption.

The plant is installed for dealing with a maximum load of 500 KW., the power absorbed by the air pump is 4 KW., and by the circulating pump 2 KW. The low power consumption is due to the fact that the amount of water circulated over the condenser and the height to which it is lifted (15 ft.) are extremely low.

Coal tests have been carried out both condensing and non-condensing under precisely similar conditions of load, and a saving of 26·7 per cent. has been obtained. In addition to this saving there is also a large saving in water, which from the town's supply costs 9d. per 1,000 gallons.

COAL TEST, JULY 27TH, 1909. NON-CONDENSING.

Time.	Machine reading.		Units.	Lb. of coal.	Lb. per unit.	—	Load in KW.
3—4	2,592	2,676	84	560	6·6	3	
4—5	2,676	2,761	85	784	9·2	4	74 5
5—6	2,761	2,837	76	672	8·8	5	72 0
6—7	2,837	2,907	70	672	9 6	6	85 8
7—8	2,997	2,976	69	1,008	12·2	7	81·9
	655,627	655,640	13			8	131·6
8—9	2,976	2,979	3	1,456	8·1	9	269·5
	655,640	655,815	175 178			10	165 7
9—10	655,815	656,008	193	2,016	8·3	11	84 6
	2,979	3,027	48 241			12	72 0
10—11	656,008	656,116	108	1,288	10 9		
	3,027	3,037	10 118				
11	3,037	3,095	58	616	10 6		
			392	9,072	9 15		

COAL TEST, CONDENSING. MONDAY, JULY 26TH, 1909.

Time.	Machine reading.		Units generated.	Lb. of coal.	Lb. per unit.
3—4	71,573	71,669	96	448	4 6
4—5	71,669	71,769	100	504	5·0
5—6	71,769	71,843	74	560	7·5
6—7	71 843	71,917	74	672	9·0
7—8	71,917	72,002	85	616	7·25
8—9	72,002	72,035	33		
	655,178	655,295	117	1,390	8·7
	2,457	2,466	9 159		
9—10	655,295	655,472	177	1,344	5·7
	2,466	2,524	58 235		
10—11	655,472	655,609	137	896	6·4
	2,524	2,527	3 140		
11—11.45	655,609	655,627	18	448	7·1
	2,527	2,572	45 63		
Total ...	—	—	1,026	6,878	6·7 26·7% saving

Pence per unit, ·3148d.

Coal used, smudge, 8s. 10d., hand fired, Crosthwaite fire bars; barometer, 29; vacuum, highest, 27; lowest, 24½; coal saving shown on tests, 26·7 per cent.

NEW CONDENSING PLANT RESULTS.

Contract price	£1,600
Interest and principal on £1,600 at 7 per cent. ...	£112
Coal 1,640 tons at present price 8s. 10d.	£724
Saving shown on test	26·7%
26 7 on £724	£193
Interest and principal	£112
Coal saving	£193

Net gain £81, after paying interest and principal.

CORRESPONDENCE.

Letters received by us after 5 P.M. on TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Coefficient of Self-Induction.

Your reviewer must again claim your indulgence in order to reply to the letter of Messrs. Cramp and Smith, published in your last issue. They accuse him of reading a meaning into their words which they had not intended. All that he did was to quote *seven* consecutive lines from one of their letters, and two from another, and propound to your readers the riddle of reconciling the statements contained in them. If this be reading a false meaning into their words, then he apologises. Messrs. Cramp and Smith may have perfectly clear notions in their own minds of what they mean, but outsiders can only judge by what they have written.

They admit that "in a strict academic sense it is, of course, true" that Maxwell's coefficient cannot be used in a vector equation at all. Yet "they cannot agree with this statement," because "if logically followed it would effectively destroy every ordinary alternating-current calculation!" In your reviewer's opinion this is sorry stuff. It sounds as if they said that the gods are false, yet we cannot get on without them. Surely it is unnecessary for scientists to assume such a humiliating attitude.

"By substituting for irregular waves their equivalent sine waves." The assumption is made here that there is such a thing as an equivalent sine wave. Your reviewer thinks that this idea was exploded some years ago.

"All this follows from, and is exemplified in, the work of Steinmetz, Thompson and many others." It is useless for the authors to quote the authority of these high priests, unless they give chapter and verse. They might as well summon Aristotle and Lucretius to their aid. They also quote the second volume of Dr. Russell's "Treatise on Alternating Currents," apparently not so much for the purpose of confuting your reviewer, but rather to point out the superior merits of their own volume.

D

They tell him that he will find in this volume under the equations for the transformer "an expression for Maxwell's coefficient in terms of the reluctance of an air circuit. Dr. Russell further points out that, to an iron circuit with constant permeability, these equations are applicable; and in subsequent calculations not only does he assume the permeability as constant, but he also attempts to justify the neglect of iron losses; of which neglect at least *we* are not guilty."

Your reviewer has looked up the references in the above quotation, and is surprised to find that they are hopelessly inaccurate. Dr. Russell does not give an expression for Maxwell's coefficient in terms of the reluctance of an air circuit. When discussing the iron circuit transformer, he neither assumes that the core has constant permeability, nor does he neglect the iron losses.

In conclusion, it is well to remind electricians that self-inductance depends not only on the number of turns, and the geometrical shape of a coil, but also on the thickness of the wire. If this wire be infinitely thin, then the inductance is infinitely great whatever may be the shape of the coil. If there is iron in the neighbourhood of the coil, the notion that the flux is proportional to the current is one which will appeal only to the simple ones of this world. To assume that this quantity can be represented by a complex variable is a leap in the dark. If we make such suppositions we can deduce from them certain formulæ which may, or peradventure may not, represent approximately what happens in practice. As it is absolutely impossible to calculate, even roughly, the magnitude of the errors introduced by these assumptions, the whole performance must remain a botching piece of work.

If there is no self-inductance when iron is present, then how can we make our calculations? It is certainly more difficult in most cases, but in a few cases it can be done quite easily. For example, we can prove easily that the magnetising turns of a constant-potential transformer are very approximately constant. We can even discuss the effects of wave shape on the voltage drop in the secondary. In this connection Ampere's and Faraday's laws are invaluable. Unfortunately no one has yet explained in a rational manner how hysteresis can be accurately taken into account in our equations. Further research in this direction is badly wanted.

It is of importance that the youthful engineer should know where the quagmires are in the grounds on which he intends some day to build. If he is ignorant of their existence, is there not a serious risk that he may erect a noble superstructure on one of them, which when the rains come, and the winds blow, will gradually sink from sight, and he will see the labour of the best years of his life pass away like a dream. Would he not then have reason to blame his teachers? Instead of warning him of the treacherous quagmires, they lure him on to them by showing that they can support light structures. Some of these seem to have drifted on to firm foundations mainly by good luck, others are at the mercy of every breeze. Is it not the duty of every teacher to purge the eyesight of his pupils with "euphrasy and rue," so that they may be able to examine carefully the foundations on which they have to build?

Your Reviewer.

Finance and Industry.

Being the inventor of a new wiring system, and after having a four months' hard struggle to raise working capital, I have read your leading article in last week's issue with the greatest interest. Every word I can personally confirm and, as far as this country is concerned, I may say that the taking out of a patent is simply child's work in comparison with the difficulty in getting the necessary working capital to put the invention on the market.

At the present time one would surely think the greatest need of the electrical industry is a cheap, simple and reliable wiring system. And, yet, what are the facts? I wrote to nearly three-hundred directors of electrical supply companies pointing out that I had invented and perfected such a system and asking their co-operation in placing it on the market. Eagerly I awaited their replies, for these were the very people who would be most interested in such a thing as a help in securing better financial results for their concerns. To my disappointment I had but one reply, and this simply stated the writer regretted he could not help me. Not one thought it worth their while to investigate matters, and yet people wonder why the Germans and Americans are getting ahead of us.

Having failed to secure the financial help of the directors, I next approached a well-known manufacturing and supply concern, whose name is a household word in the electrical industry. This firm simply acknowledged my letter, and stated the matter would have further consideration. After waiting for some time, I decided to call personally and investigate matters. As the gentleman I wanted to see was engaged at the moment, I had a conversation with the manager of the showroom, and I explained my new wiring system to him by means of actual models. He examined them carefully, and was quite enthusiastic in praise of the whole thing. Just then the gentleman I wanted to see came along, and the following took place:—"Oh, Mr. Martyn, we are writing to you to-day to say your new wiring invention does not interest us." The manager of the showroom: "Oh, Mr. So-and-So, have you seen this system?" "No; what is it?" Further comment is needless. And yet a shareholder friend of mine wonders why this firm is doing so badly.

I am now in communication with some city people, but it is difficult to say if I shall be successful in raising the necessary working capital, and I am determined the invention shall not be strangled by company promoters. The system is so simple that any village mechanic could erect it, so reliable that it is safer than any method now in use, and its cost should be about half in comparison with present standards. It has been most favourably reported upon by well-known consulting engineers, central station engineers and even by yourselves (see page 216 of the ELECTRICAL REVIEW, August 6th, 1909); and for the want of working capital I am beginning to doubt more and more every day if I shall succeed in getting it on the market in this country, and for this reason an invention which is undoubtedly of the greatest benefit to the electrical industry must stand on one side.

Sarsfield W. Martyn, A.M.I.E.E., A.M.I.Mech.E.

London, N.W., *October 19th*, 1909.

British-made Magnetos.

There recently appeared in your columns a letter calling attention to the fact that the large majority of British motor-cars are fitted with foreign magnetos. Your correspondent drew some conclusions rather to the detriment of British electrical manufacturers, and finally asked why it was that no British firm could turn out a magneto to compete with the foreign machine. He concluded by saying that the car manufacturers are only too anxious to secure a reliable British magneto. May we offer some observations, as the result of our experience?

We have been manufacturing ignition apparatus for motor-cars almost since the beginning of the motor industry, and have equipped thousands of cars, and can claim, we think, to be fairly experienced in ignition requirements.

About four years ago we turned our attention to magnetos, and spent some thousands of pounds in experimenting, until finally we brought our machine to perfection. Our magneto gives dual ignition and switch starting from the dash, and is considered in many respects in advance of any other magneto. In price also, our magneto will compare very favourably with all the leading foreign makes.

We have spent large sums in advertising, and as a result we are selling a large number of machines. The magnetos we have supplied are giving every satisfaction, and in every way it would seem as though the British magneto problem were solved.

So far, so good; but when we approached the car manufacturers our difficulties commenced.

Your correspondent said that the motor-car makers would rather use a British magneto if they could. We wish this were so, for we have found nothing but obstacles placed in our way up to the present. In some cases the car manufacturers are willing to test the magneto, and are even quite flattering in their reports, but this is as far as they will go.

It appears that makers have even signed agreements with foreign magneto firms undertaking to supply no other magneto than their own unless the buyer of the car definitely specifies another make. In fact, we have this morning received a letter from a well-known car maker in precisely these terms. The British magneto manufacturer is thus on the horns of a dilemma, and he must, perforce, appeal to the public.

If the public will specify British magnetos for their new cars for next season, the car manufacturers will be unable to refuse to supply them. The matter really rests in the hands of the public, and it is entirely at their option to encourage or discourage the home manufacturer of electric magneto equipment.

Jno. C. Fuller & Son.

London, E., *October 20th*, 1909.

The Relative Costs of Electricity and Gas.

For the purpose of comparing the relative costs of lighting by electricity and gas, I understand that some Government officials assumed 8 units equivalent to 1,000 ft. of gas.

Would you please state what price of gas is equivalent to electric light (100 volts) at 6d. per unit with Osram lamps.

Can you give such standards of comparison as used by the Postmaster-General, any Government department, or big Corporations?

A. B. C.

[This, as has often been pointed out, is a fallacious mode of comparison. It is like comparing an electric oven with a kitchen range on the single and inadequate basis of cost of fuel. There is no direct comparison of any value on such a restricted basis. The cost of electricity under the conditions stated, would be about the same as that of the gas required to give the same number of candle-hours, at 3s. per thousand cubic feet, but the cost of running an establishment lighted with electricity has repeatedly been proved less than that of one lighted with gas.—EDS. E.R.]

Publication of Prospective Business.

I think it would be interesting to hear the views of your readers on the publication of prospective business. My own idea is that it is hardly less than a curse to manufacturers, their representatives and purchasers alike. What happens is that a paragraph appears in the papers to the effect that the T.C. of Timbuctoo had before them a report by the engineer, Mr. Smyth-Jones, *re* extensions. Thereupon every manufacturer who is any good bombards Mr. Smyth-Jones with circulars, and hosts of representatives call upon him. Ultimately the matter is either shelved or tenders are called for, and there is the same old fight for the contract at an unremunerative figure. The net result in any case is that the manufacturer and his representative have wasted time, trouble and money, the engineer has been bothered, and nobody is any better off than if the job had never been mentioned till tenders were invited.

J. S.

Contractor, Supply House, and Manufacturer.

Do you not think that it is about time the contractor, the supply house, and the manufacturer understood exactly their respective positions in the electrical world? Every week there appear letters in the electrical papers calling attention to either one or the other of these people cutting one another's throats and tumbling over each other in the effort to secure business.

Only this week I notice that one of the largest electrical machinery manufacturers in the country has accepted a paltry wiring job, but has placed the carrying out of the work in the hands of a contractor. (Observe the kindness in cutting a man's throat and then giving him a piece of sticking plaster to patch it up again.)

And what do you think of the lamp manufacturer who, instead of openly giving better terms to the consumer, sneakingly offers him lamps at 14 to the dozen?

Surely it is about time that something was done to put this thing down, and the sooner it is done the better it will be for all concerned.

Supply or Contract (not both).

A Question on Load Factor.

Will some one kindly inform me whether I should be correct in including the capacity of the battery in determining the load factor of a tramway station, and, if so, how this should be determined?

The plant consists of two 100-KW. generators and a battery of 980 ampere-hours capacity. The machines run about 14 hours a day, the load being commenced and finished on the battery.

I feel inclined to ignore the battery, take the station capacity as 200 KW., and reckon on a 14-hour day.

Ratio.

The Publication of Salaries.

It has often been a matter of wonder to me why you publish particulars of salaries. Of what possible interest to anyone can it be to read, as those who run may do this week, of the appointment of a gentleman at 30s. per week? Moreover, there are the recipients themselves to consider. I should think the feelings of any engineer would at any rate be mixed when reading in the paper that his salary had been increased from £200 to £210 per annum, which seems to be about the usual extent of Corporation generosity.

J. S.

Unemployment.

I have been much interested in the correspondence on unemployment and combination in your last few issues. The question is one that vitally affects the workers, whether they style themselves electricians, electrical fitters, or wiremen, but I cannot let the letter of "Unity is Strength" pass without comment. He says: "Most people are aware there is already an Electrical Trades Union, but the bulk of their members are wiremen;" so far 'tis true, but he goes on to say: "They do not make any provision for other branches, and even if they do, all candidates accepted are classed as wiremen, that being their main object." This is simply rubbish; the men accepted in the Electrical Trades Union are classed according to their trade, the same as they are in any other trade union. Again, "what we want to do is to organise electricians, men who have served a specified time at the trade, and can do wiring, and are capable of taking charge of plant, and doing running repairs." This is exactly what the Electrical Trades Union has been trying to do for some years, and the "bulk of their members" have exactly these qualifications.

The fact of the matter is, the term wireman has been as much abused as the term electrician.

A man or a youth who has been about a fortnight carboning arc lamps (and cleaning windows) in a draper's shop, becomes at once an "electrician," but after following various phases of employment and half ruining a few contractors who have eccentric ideas of cheapness, he may become a species of wireman, but, fortunately, there are other types of wiremen. There is the man who has served a genuine apprenticeship and is able to lay down an electrical plant, including motors, switchboards, wiring, telephone, bells, lifts and all the many electrical appliances now so common to a modern works, ship, or block of offices. This is the real wireman, and with all due respect to other grades, he is one of the most important units in the electrical industry.

To those "electricians" in charge, shift engineers, substation attendants, and others who may feel they are above the ordinary trade union, let me point out that by combination in the Electrical Trade Union many others in addition to armature winders and wiremen have been enabled to establish a reasonable rate of wage, that we have an efficient organisation ready to hand, that we desire to see all grades of competent electrical workers combined, and if these men are really anxious to see better conditions prevail, they will not endeavour to form a multiplicity of sectional organisations which will only lead to chaos, but will join the

organisation which was formed, and is maintained, by electrical tradesmen for the betterment of the electrical trade. By so doing, "Unity is Strength," and others who have written on the subject, will be carrying out their own ideas to their logical conclusion.

In furtherance of these objects, I will be pleased to correspond and give further information to any who will write to me direct.

J. Rowan,
General Secretary, E.T.U.

Manchester, *October 20th*, 1909.

If my first letter starts a society of the genuine brand of electricians demanding a living wage and keeping up the prestige of our trade, I shall not only be rewarded, but delighted; this is the only means of extracting the wheat from the chaff.

The great complaint and growing evil is that the electrical market is flooded with inexperienced men, whilst the good brand are shut out.

In these days of combines and federations of masters fighting the right with their might, it is incumbent to keep up a defence (not defiance); therefore, I am rather afraid of new-born societies, because their weakness is a loophole for cowardly attack. My reference to the A.S.E. electrical section was owing to its long and tried establishment and powerful representation in the House of Commons on burning complaints and trade injustice and tyranny.

We often hear of the tyranny of Trade Unionists in shops in not giving a royal welcome to men with a keen relish for plums fought for and dearly bought by others. We shall always find plenty of passengers willing to travel without paying their fare. Bad as the boycotting is, this is nothing to the tyranny of masters if we stand alone.

In some cases men offer their services merely for the experience, whilst their board and clothes are found or drawn from the bottomless pit of unearned increment. What chance has the poor boy with brains, and no cash, or rich parents to lean on for supplies?

As magnetism and electricity are twin sisters, so are theory and practice. Practice is the proof of the pudding, and men with merits and ability should have a clear road to elevation, and poverty should never be a hindrance.

Wm. Podmore.

Sheerness-on-Sea.

Train Lighting.

Will any reader please give information on the following points relative to train lighting by electricity?—

1. Name of firm, making and pushing the "Moskowitz" system, or any railway on which it is in use, results, &c.
2. Any railway using the Leitner-Lucas system.
3. Any railway on the Continent (or elsewhere) actually using a turbo-generator set on the engine for main lighting, with data, or where the same can be obtained.

Railway.

"STERLING" CENTRAL-BATTERY AUTOMATIC INTERCOMMUNICATION TELEPHONES.

The march of progress in electrical science, which is constantly bringing into view new and surprising developments in almost all branches of the industry—so that what was novel five years ago has become a "back number" to-day—is as steady and continuous in telephonic matters as in any other department of electrical activity. But the great advances that have been made in telephony are probably less fully appreciated by the bulk of the electrical profession than those in more familiar subjects, principally because there is so little in common between telephony and the heavier branches of electrical engineering. Telephone engineers, like telegraph engineers, are, above all things, specialists; and their work, except in respect of its fundamental principles, is to a great extent a sealed book to the average electrical engineer. Nevertheless it is a most interesting subject, well worthy of study and presenting many remarkable examples of mechanical ingenuity and patient evolution.

Sometimes, as recently in the lighting industry, revolution is a more appropriate word. The introduction of the central-battery system into exchange communication, for example, whereby innumerable isolated primary batteries at subscribers' stations were replaced by one big storage battery at the exchange, practically effected a revolution in this class of work. The adoption of the system in connection with the allied function of intercommunication between the different offices or departments in a single

Fig. 1.—Automatic Intercommunication Battery Ringing Telephone, with Radial Switch, Wall Type.

building has been somewhat delayed, doubtless on account of the difficulties inherent in this special problem; it must be borne in mind that in this case no staff of experts is at hand to remedy defects, and therefore no defects must be allowed to arise; moreover, there are no switchboard operators to put the different stations in communication with one another; each user is his own operator. There are also technical and commercial difficulties to be overcome.

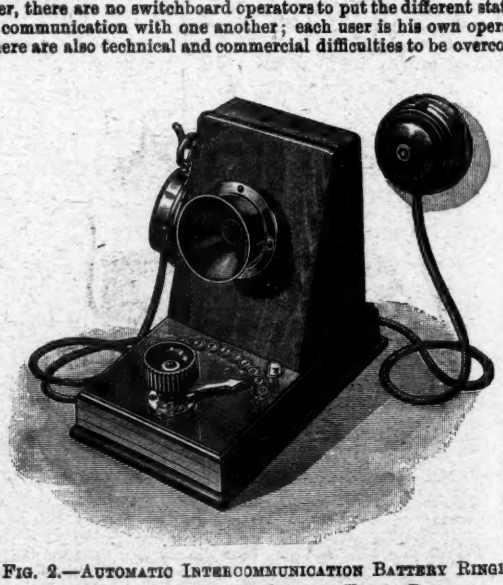


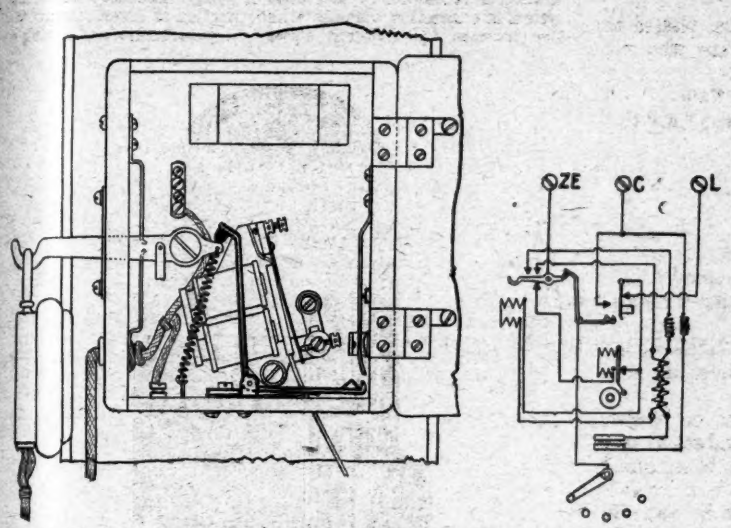
Fig. 2.—Automatic Intercommunication Battery Ringing Telephone, with Radial Switch, Table Pattern.

A solution of the problem has been attained, however, and is embodied in the new system of "automatic intercommunication telephones" which has recently been put on the market by the Sterling Telephone and Electric Co., Ltd. In this system only one central battery is employed, and a great economy is thus effected; for example, in an installation comprising 10 stations, 20 microphone cells are dispensed with, their place being taken by one battery of six cells, which serves for both ringing and speaking. This improvement has been extended to all the company's intercommunication telephone equipments, except those in which magnetos are used. Fig. 1 shows one of the wall instruments, and fig. 2 a table set, of the radial-switch type, employed in this system. An important

feature of these is the ingenious patented device employed by the Sterling Co., to effect self-replacement—the "automatic" feature. What this device accomplished was briefly explained in our issue of May 28th. We are now permitted to show *how* it is done.

The object of the device is to restore the connection between the receiver and the home line automatically after another station has been called up; so that, no matter what stud the selector switch arm is left on, the station, when not in use, is always in readiness to receive a call. In the ordinary way, to effect this purpose, it has been necessary to fit a separate movement for each line at each instrument, but, with this device, one lever fulfils the whole of the requirements. To answer a call, the user has merely to raise the receiver and listen, his selector switch being out of the circuit altogether. To originate a call, the user places the selector switch on the desired contact, raises the receiver, and rings, the act of ringing disconnecting the home line and connecting the receiver to the line selector switch. The replacement of the receiver on the hook when the conversation closes again actuates the lever, connecting the receiver to the home line and disconnecting the selector switch. Besides effecting these operations, the device, by disconnecting one line, reduces the capacity of the circuit and thus minimises cross-talk. This is made clear by the diagram, fig. 3, which with the footnote is self-explanatory.

It should be added that the illustrations given only represent two out of many patterns of the radial-switch type; and fig. 4 shows one of the multiple-lever instruments, arranged for central-battery working, in which the ordinary separate self-restoring movements are employed.



By raising the receiver and pressing the bell-push (on the right hand) a call is given; on releasing the push, the bent lever retains the receiver in connection with the selector switch, but when the receiver is hung up, the bell-push is released by the bent lever and the home-line connection is restored.

FIG. 3.—INTERIOR OF "AUTOMATIC" TELEPHONE, AND DIAGRAM OF CONNECTIONS.

FIG. 5.—"INVICTA" SACK CELL.

FIG. 4.—"ERA" AUTOMATIC I.C. TELEPHONE, MULTIPLE-LEVER TYPE.

If one puts all one's eggs in one basket, it is advisable to "watch that basket;" the Sterling Co., while putting all its cells into one battery, has endeavoured to render the task of watching the battery a sinecure, and to this end has investigated the battery question very closely. We were interested to learn during a recent visit to the company's showroom, that the result had been the adoption of a "wet" cell, doubtless on account of the lower resistance and greater reliability of this type. The pattern selected is entirely new—the two-quart "Invicta" sack type, illustrated in fig. 5. In this cell, it will be noticed, the zinc, a split cylinder of large size, rests upon four inward projections of the glass jar, and is guided at the top by similar projections; connection is made with it by means of a leaden strip, with a screw terminal at the free end. A glass cover is provided, with a central hole for the carbon rod, and a slot through which the lead strip passes. A recess in the bottom of the jar receives the lower end of the carbon rod, round which is the "sack" containing the depolariser; the rod fits freely in the sockets, and carries a terminal at the upper end. The whole is of sound mechanical design; the jar is exceptionally deep (11 in.), and creeping is abolished. Six of these are required to form the central battery for an installation of 10 or 15 stations.

The advantage of getting rid of a large number of scattered batteries is self-evident; at the same time the difficulty of finding convenient places to put them in, and the unsightliness of the necessary connections, are obviated when the central-battery system is employed. We have no doubt that the improvement will meet with the approval of the user, and that the enterprise of the makers will be duly rewarded. We may add that the company's works at Dagenham (Essex) have commenced the manufacture of telephones and allied apparatus.

DIFFERENCES BETWEEN ENGLISH AND AMERICAN PRACTICE.*

By J. S. CONOVER.

MANY engineers and manufacturers have often wondered why there seemed to be so little demand in England for articles which are sold in this country in large quantities. This condition is largely due to certain differences in engineering practice, and the following explanation of some of these differences may be of interest to the readers of the *Review*.

The early progress in the electrical lighting field in England was greatly impeded by the strict regulations imposed by the Government, which made the cost of producing and distributing electricity so high as to be almost prohibitive. In the early nineties these regulations were materially modified, and the electric lighting industry began to advance with considerable rapidity. One important regulation remained and is still in force, which in itself is sufficient to account for many of the differences in lighting practice between this country and England. Under this regulation practically all electric lighting wires in cities and towns, large and small, have to be placed underground. This requirement has been one of the principal factors in limiting the use of electricity for lighting purposes to cities or towns of about 20,000 inhabitants or more, as smaller towns cannot often afford the expense of an underground cable system. In the large cities in this country underground cables are generally used, so that the difference in practice is much less marked than in the case of smaller cities and towns in which overhead cables are mostly used, except, perhaps, on a few of the principal streets.

Another fact which has undoubtedly had a considerable influence upon the use of electricity for lighting purposes in small towns is that, in England, most of the towns were provided with a gas plant and distributing system before the advent of electricity into the lighting field. In this country such was not the case, as many of the towns of between 5,000 and 10,000 inhabitants have only come into existence within the last 10 or 15 years, and electricity has had the same chance with gas of being first in the field. In this

* Abstract of an article in the *General Electric Review*, U.S.A.

country over 60 per cent. of the central stations generating and distributing electricity for lighting purposes are in towns of less than 5,000 inhabitants.

A large majority of the electric lighting plants in England are owned by the municipalities, which also own the street railway systems. In the smaller towns in which only one generating station is required, it is economy to combine the lighting and railway stations in one. It is also economical and convenient to have the generators so designed that they can be used for either class of service. This has led to a demand—which is practically unknown in this country—for direct-current generators which will give about 460-480 volts as shunt machines, and which are provided with a series field so that they will give 500-550 volts when operated as compound-wound machines.

The system of street lighting generally used in England is the series multiple; that is, two lamps in series on 220-240 volts, or four in series on 440-480 volts; or the straight multiple. Series are and incandescent systems are practically unknown.

The comparatively small amount of alternating-current distribution naturally limits the demand for lighting transformers, and even this demand is different from that in this country. The underground cables necessitate the grouping of transformers and the use of larger sizes, so that the demand for transformers of under 20 KW. is very small. All lighting transformers have to be provided with ground shields, a requirement which prevents transformers of standard American construction from being used.

A very marked difference exists in the demand for meters, apart from that due to the difference in the relative proportion of alternating and direct-current distribution. In this country practically all house-service meters are wattmeters; in England nearly all direct-current house-service meters are ampere-hour meters.

Until recently the principal differences in incandescent lamps have been in the voltage and the type of base. The English demand has been primarily for voltages between 220 and 240, and the bayonet type of base.

The demand for lighting apparatus in this country and in England differs in amount as much as in character, if not more. By 1902 or 1903 most of the cities and towns in England that could support an electric lighting plant, had one. The growth of cities and towns there is very slow compared with that in this country, and very high buildings are not replacing those of moderate height; so that after the more thickly settled portions of a city or town have been supplied, the yearly demand due to expansion is relatively small. In this country the erection of very high buildings in place of those of four or five stories creates an ever and rapidly increasing demand in a given area. Furthermore, the use of electricity in England is limited more to the real need for light, and does not extend to any considerable extent into the realm of advertising. The central portion of London is fairly well lighted, from the standpoint of convenience and safety, but it is dark as compared with New York, due to the lack of brilliant advertising displays. The yearly increase in the load of the New York Edison Co. is, I believe, about 20 to 25 per cent., while the yearly increase in the total lighting load in London is not more than 5 or 10 per cent. The total yearly sale of incandescent lamps in this country at the present time is estimated to be about 60,000,000, whereas in England, with a population approximately one-half as great, the total yearly sale probably does not exceed 15,000,000.

In the railway field there are fewer marked differences between the practices of the two countries, although a number of quite important ones is to be noted. The most important, perhaps, is that of speed. In England the maximum speed for street railway cars allowed by the municipal regulations (which are generally enforced) is about 12 miles per hour. In this country, while there are regulations in most cities, they are not strictly enforced, and the average maximum speed in cities and towns is about 25 miles an hour.

To the writer's knowledge, no interurban roads using the public highways have been built in England. Whether any attempts to promote such roads have been made is also unknown to the writer, but it is pretty certain that speeds of from 40 to 50 miles per hour, which are common in this country on the public highway, would not be permitted in England, and the authorised speeds would probably be so low as to make the service unattractive and the undertaking unprofitable.

Another regulation which tends to limit the extension of electric roads into the more thinly populated districts, is that the drop in voltage in the return circuit shall not exceed seven volts. This regulation has made the use of track boosters quite common, and even with these boosters the cost of return cables becomes a serious item on lines extending into the suburbs. The limits set for speed and for drop in voltage in the return circuit have had the effect of confining the field of the electric railway to the fairly thickly settled portions of good-sized towns.

A fact which ought not to be overlooked in this connection is that the average English working man's wages give him a very narrow margin above his bare living expenses, and he will walk a considerable distance rather than pay a car fare. This fact alone would make a failure of a street railway in an English town of a size sufficient to support a good paying road in this country.

The type of street car generally used in England differs from that used in this country, in that it is of the double-deck type with seats on top. The low speed employed makes this type of car possible, and as the regulations limit the number of passengers carried to the seating capacity, this can be almost doubled without much expense or additional weight.

The usual practice in England is to string the trolley wires on the side of instead of over the middle of the track. This is done to minimise the length of brackets and to permit their use wherever possible, as they are considered more sightly than span wires. This type of overhead construction necessitates the use of a trolley with a swivel head, which design is practically unknown in this country; furthermore, the double-deck car requires a special type of trolley base to prevent the trolley pole from interfering with the passengers. There is, therefore, practically no demand in England for trolleys of the types which are standard in this country.

The low speeds do not necessitate motors of as great capacity as those generally used in this country, and lower armature speeds are required. This latter requirement led first to the design of special low-speed armatures to fit frames of standard American type, but lately it has resulted in the design of special motors for the English conditions. The low speeds also make it feasible to use electric brakes, which have never been employed to any extent in this country, and which necessitate a different type of controller from that generally used here.

In the field of heavy traction the English practice has adhered more closely to ours.

In the industrial field the difference between English and American practice is, perhaps, more one of degree than of character.

Competition in most lines of manufacture is very keen, and profits are generally smaller than in this country. Stockholders are very insistent upon the payment of regular dividends, and as the directors of joint-stock companies are personally liable for the payment of dividends which have not been earned, they are very careful to satisfy themselves that such have been earned before authorising their payment. The natural result of these conditions is a tendency to minimise the amount allowed each year for depreciation, and as the initial plants are generally of a very substantial character, rates of depreciation which would not be considered sufficiently high in this country are considered satisfactory in England.

Many manufacturing firms in England are just about able to pay a dividend, after making the usual provisions for depreciation.

The difference in conditions between the two countries extends even into the field of renewal parts. A characteristic of the English is their ability to make things last a long time and continue to give good service. This is due, in some measure at least, to the fact that they usually have an ample equipment for the requirements of the service and are able to give it systematic inspection and care.

The English market can be classed as a very restricted one as compared with our market. A restricted market must have an effect upon those who are supplying it, and the natural result is relatively small production and a limited stock. This is just what one finds in England in nearly every branch of business. It is quite clear that a manufacturer who has a small production and carries only a very limited stock cannot afford to install the same sort of equipment as the manufacturer who has a large production and carries a large stock. The English manufacturer must then get along with the minimum equipment, and have that equipment as flexible as possible.

The necessity for minimising his equipment has forced the English manufacturer to make the best use of what he has, and in doing this he often shows great skill. In going through one of the large shipyards on the Tyne, near Newcastle, I remember being very much impressed by finding in the middle of an old and badly-lighted shop with a very poor equipment of tools, a thoroughly modern 5,000-H.P. triple-expansion marine engine in process of construction, the height of which was so great that a hole had been made in the roof to permit of its erection. The average American manufacturer would not undertake to build saw-mill engines in such a shop and with such an equipment, and yet I doubt if the best equipped shop in America could produce an individual engine of equivalent size and type, of better quality or at a lower cost. If a number of duplicates were required, the English shop would, of course, be at a great disadvantage; but in England a number of duplicates are seldom required, and the manufacturers' facilities are fairly well suited to the character of the demand.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Veritys' Installation Manufactures.

We understand that since the issue of "Verity in Three Volumes," MESSRS. VERITYS, LTD., of 31, King Street, Covent Garden, London, W.C., have been so constantly asked by their customers for particulars and prices of small plants suitable for up-country electrical installations in bungalows and on tea and rubber plantations, that they have published a pamphlet, X108, giving the details generally desired, and a copy of this is before us as we write. It shows direct-coupled petrol or paraffin engines and dynamos, and all other parts going to make up an installation. The plants are well past the experimental stage, for Messrs. Veritys have quite a number of them running here in England, and already several abroad. It is claimed that they are so simple that the average gardener or groom can easily look after them, and owing to their small weight they can readily be moved to fresh quarters when desired. They consist of a high-speed vertical petrol or paraffin engine coupled, as shown in the illustration, fig. 1, to an "Aston" dynamo; the pamphlet also gives particulars and prices of accumulators, ceiling fans, fittings and other sundries which are

generally required in connection with such installations, and to simplify matters for non-technical buyers there is given on the back page a complete estimate for an average installation.

To meet the requirements of the increasing number of alternating current electricity supply systems abroad, Messrs. Veritys have for the last 18 months been preparing alternating-current ceiling fans, such as would be suitable for use in the tropics; this new fan, the "Rangoon," is now ready, and after tests extending over several months, it is claimed to be as great a success as their 1909 D.C. ceiling fan. A point about this fan, and one which friends from abroad have accentuated, is its silent running. The fan is English made, and is shown in fig. 2. These ceiling fans are stove-enamelled, and consequently are readily kept clean with a damp cloth, an improvement on ordinary painted fans. The fan can be fitted with two, three or four blades, which are set up at a large angle and pitch, and therefore give a most excellent breeze, even when running slowly.

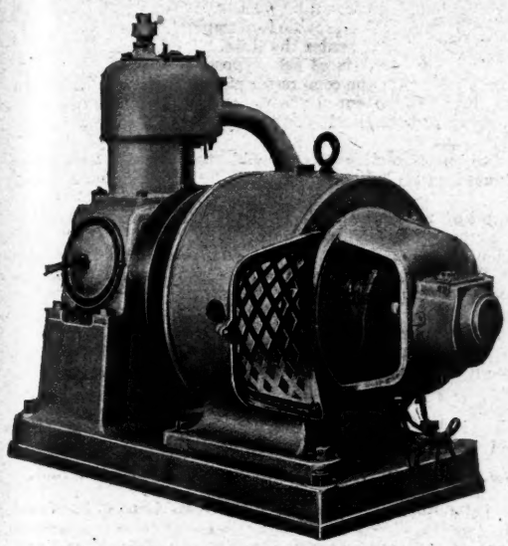


Fig 1.—Veritys' Small Electric Lighting Sets for Bungalows and Up-Country Stations.

Fig. 2.—Veritys' "Rangoon" Ceiling Fan for Alternating Current.

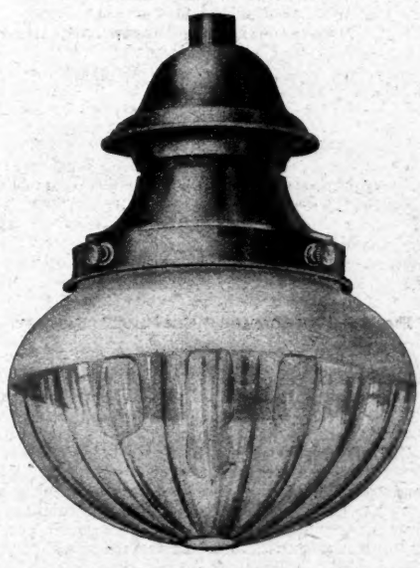


Fig. 3.—Veritys' New "Radiant" Lantern for Aston Metalamps.

Another item for which a large sale abroad is expected is the firm's new "Radiant" lantern, which has been brought out to meet the demand for a lantern having all the advantages of an enclosed arc lamp as to brilliancy of illumination, but requiring no daily or weekly trimming. The efficiency of these lanterns when fitted with "Aston Metalamps," is stated to be very high, and by their use they will give as much as 400 C.P. The lamp is understood to be an effective and economical lantern for shop and street lighting. It is fitted with specially fluted globe with self-contained opal reflector, so that the light is well diffused, and it has been found to be a very popular way of lighting small shops.

Ferranti High-Tension Ironclad Mining Switchgear.

Messrs. Ferranti, Ltd., of Hollinwood, have recently placed on the market a new design of high-tension ironclad switchgear to meet the demand for absolutely safe, simple and fool-proof switchboards for use in collieries, mines, factories, and other works receiving high-tension supply from a central station. The design, as shown in fig. 4, is simple and inexpensive. The bus-bars are contained within a separate chamber situated at the back top corner. This compartment is normally kept locked while the bars are alive, but access can be obtained to it by unlocking doors at the back (when the gear is erected clear of any walls) or from above (when erected to butt up against a back wall).

The equipment of the feeder cubicles usually consists of cable receiver, two isolating switches, automatic oil switch, ammeter and current transformers; the transformer panels require only one isolating switch.

Fig. 4.—Ferranti High-Tension Ironclad Mining Switchgear.

The gear is primarily arranged to receive the minimum necessary apparatus as above enumerated, with perhaps the addition of a voltmeter or other device to indicate when the feeder or bus-bars are alive. It is, however, very flexible, and can be arranged to accommodate additional transformers where wattmeters, relays, power-factor indicators, Merz-Price protection or other refinements are specified.

When required, the interlocking can be very completely effected. The isolating switch (in the case of the feeder cubicle both are coupled together) is interlocked with the main switch, so that it

cannot be opened or closed unless the main switch is open. The isolating switch may further be interlocked with the front panel, so that the latter cannot be removed unless the isolating switch is in the open position, and, finally, the panel closing the cubicle at the back is provided with an indicator showing whether the isolating switch of the corresponding cubicle is open or closed. Thus the apparatus in each cubicle can be examined with perfect safety and without interrupting the supply.

In the design of this gear special attention has been paid to the position and method of fixing the cable receiver so as to enable the feeder cables to be easily coupled up; all connections are of the simplest and most straightforward character, and the main switches are arranged for ready withdrawal for examination or otherwise. These switches are of the free-handle type, with indicators showing whether they are open or closed, and they can be arranged for operation on overload with or without time-limit devices, reverse power, or in accordance with the Merz-Price system.

The gear is built upon the unit system, and can be extended indefinitely in either direction, each panel being self-contained and separated from the adjoining ones. It is very suitable for use under temporary conditions, as it can be erected, dismantled, transported and re-erected, when required, in the minimum of time.

A Handy Refrigerating Plant.

Some time ago a well-known engineer—Colonel Crompton, we believe—referred, at a meeting of the Institution of Electrical Engineers, to the great field which existed in hot countries like

Fig. 5.—Self-contained Electrically-driven Ice-making Plant.

India, for means of producing "artificial cold," and there is no doubt that the small refrigerating plant when electrically driven is a most compact and convenient appliance for this purpose. Last week we referred briefly to the electrically-driven refrigerating

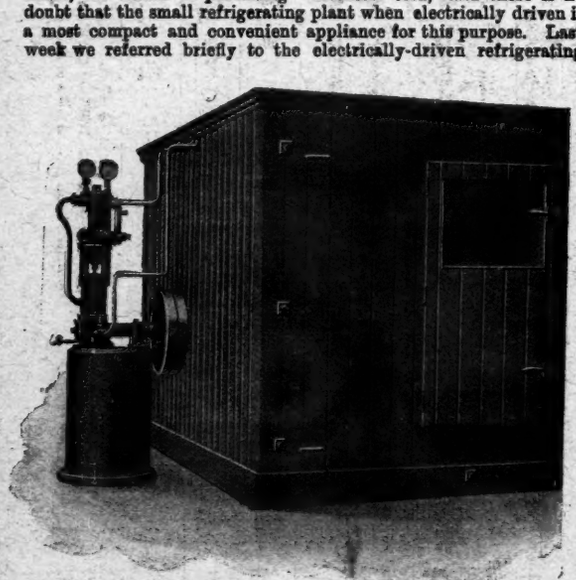


Fig. 6.—Cold Storage with "Zero" Compressor.

plant shown by Messrs. Worssam & Son, of Wenlock Road, City Road, N., at the East London Electrical Exhibition, consisting of one of the firm's "country house and hotel" installations.

In this the cold air chamber is provided with the necessary hooks and shelves for the reception of perishable goods, the low temperature being obtained by means of cold brine, which is carried in a tank suitable for storage, so as to obviate the necessity of continuous running and allow of the plant being shut down over a week end.

The brine tank forms an internal partition of the store, and contains the cooler coil in connection with one of the firm's "Zero" compressors, driven by a small electric motor.

The brine tank is protected by wooden screens with hinged doors at top and bottom, which provide for temperature regulation without it being necessary to enter the store.

The "Zero" machine is of the enclosed type, with the working parts running in oil; the compressor piston is fitted with metallic packing rings, and no cup leathers are used. The compressor is single acting, and the gland is only subjected to the low pressure of the suction gas.

In addition to cooling the store, blocks of ice for table use can be produced in moulds inserted in the brine tank from above the store.

The cost of mechanical refrigerating plant suitable for private house purposes, usually ranges from £85 to about £140, being dependent on such factors as size and storage accommodation. Messrs. Worssam make a compact little ice-making plant, in which the compressor and ice-making tank are entirely self-contained and driven by a small motor energised from accumulators. This plant is illustrated in fig. 5.

The firm are makers of both carbonic acid and ammonia compression plants, and recommend the former for small stores, owing to the odourless and harmless nature of the CO_2 used, and its cheapness.

Cooling is effected either by direct expansion, air circulation, or brine circulation, each system having its particular application.

Low-Voltage Batteries for Metallic-Filament Lamps.

The Chloride Electrical Storage Co., Ltd., of 39, Victoria Street, London, S.W., are making a speciality of low-voltage batteries of moderate capacity for use with the various kinds of metallic-filament lamps which are producing a silent revolution in the electric lighting industry. With these new lamps the size of the generating plant necessary for a given number of lights is so

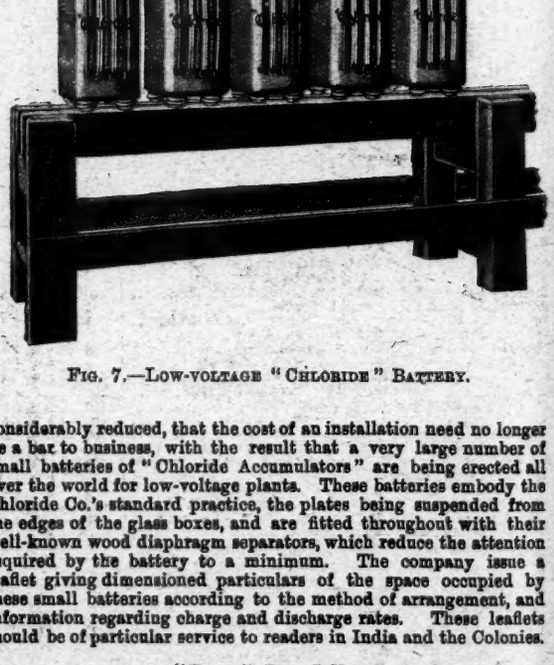


Fig. 7.—Low-voltage "Chloride" Battery.

considerably reduced, that the cost of an installation need no longer be a bar to business, with the result that a very large number of small batteries of "Chloride Accumulators" are being erected all over the world for low-voltage plants. These batteries embody the Chloride Co.'s standard practice, the plates being suspended from the edges of the glass boxes, and are fitted throughout with their well-known wood diaphragm separators, which reduce the attention required by the battery to a minimum. The company issue a leaflet giving dimensioned particulars of the space occupied by these small batteries according to the method of arrangement, and information regarding charge and discharge rates. These leaflets should be of particular service to readers in India and the Colonies.

"Dura" Dry Cells.

Messrs. Siemens Bros. & Co., Ltd., of Caxton House, S.W., have brought out a dry cell specially adapted for export and for use in hot climates, called the "Dura" cell. All dry cells are more or less alike externally, but the peculiarity of the Dura cell is that it is really "dry"; the cell is issued with the exciting agent in an absolutely dry condition, so that there is no possibility of deterioration during transport or storage. The cell is rendered active by adding pure water to the contents, by way of a charging tube; it is then ready for use in the ordinary way. The cell is fitted with the usual brass terminal and wire connection, but can be supplied with two locking terminals if desired.

A somewhat similar cell, in respect of portability and freedom from deterioration, is the Siemens "Transport" cell. In this case the excitant is fluid, but cannot escape, the filling tube being provided with a water-tight screw-down cap. When the cell is not wanted for a time, the exciting fluid can be poured off and the

cell rinsed out, after which it can be stored for any length of time, in any climate, being recharged with solution only when it is required for use. As the internal resistance is low, these cells can be used for ignition purposes, for lighting small glow lamps for short periods, &c.

LEGAL.

Metallic-Filament Lamps.

The Welsbach Incandescent Gas Light Co. Summoned.

Before Mr. Bros, at Clerkenwell Police Court on Saturday, the Welsbach Incandescent Gas Light Co., Ltd., were summoned at the instance of the Wolfram (Tungsten) Metal-Filament Lamps, Ltd., and the General Electric Co., Ltd., the alleged offences being applying a false trade description to goods (lamps) which they had in their possession, and which they sold under the name of "Welsbach Aur" lamps. There were also summonses against Mr. Lawrence Fletcher, managing director of the defendant company, for having caused false descriptions to be made concerning those lamps.

Mr. Rufus Isaacs, K.C., Mr. H. A. Colefax and Mr. E. Lunge represented the plaintiffs, and Mr. A. Walter, K.C., and Mr. A. H. Bodkin appeared for the defendants.

At the outset it was stated by Mr. Walter that they would elect to have the case tried by a jury. The summonses against Mr. Fletcher were adjourned until the summonses against the company were disposed of.

Mr. Rufus Isaacs, in opening the case, said the summonses were issued under the Merchandise Marks Act of 1887. The Welsbach Incandescent Gas Light Co. was incorporated for the purpose of dealing with the inventions of Baron Auer von Welsbach, a famous inventor in relation to lighting plant, and the inventor of what was commonly known as the incandescent gas mantle. The connection of the company, however, with Baron Welsbach was entirely in relation to gas lighting, and had nothing to do with electric lighting. A German company known in this country as the Aur Co. had acquired Baron Welsbach's inventions in Germany in relation to gas lighting, and subsequently acquired the invention in relation to metal filaments for electric lamps. That was a lamp in which the metal filament was distinguished from the carbon filament, which had hitherto, but not entirely, practically ruled the market. The metal filament was made of a rare metal called osmium, and the lamp was designated the osmium lamp. Apparently, inventors had been devoting a considerable amount of attention to finding some means of making this metal filament which would be commercially developed, but Baron Welsbach had succeeded in inventing this lamp, which was never in any way, whether as an invention or as a manufacture, acquired by the Welsbach Incandescent Gas Light Co. The Aur Co. had appointed the General Electric Co., Ltd., their exclusive agents for the sale of this lamp in this country. After a little time there was a further invention which was of great practical and commercial utility, and which consisted, among other things, of using for the metal filament a metal which was known as "wolfram" or "tungsten." That appeared to be a cheaper and a commoner kind of metal, with the result that it became at once a very useful and a very popular mode of making metallic-filament lamps. The Osram lamp was made of this "wolfram" or "tungsten," and was made under the invention of the German company known as the Aur Co., which introduced the Osram lamp into this country. The Aur Co. was therefore the pioneer and the introducer to this country of the metal filament made of "tungsten." The General Electric Co. was also appointed the exclusive agents in this country for the sale of these Osram lamps, and subsequently, under the Patent Act, a factory was established in this country by a company known as the Wolfram (Tungsten) Metal-Filament Lamps, Ltd., consisting of a number of persons associated with the General Electric Co. and the German company known as the Aur Co. That had become an immensely valuable business, and there had been a large demand for those Osram lamps, which were known as metal-filament lamps. On September 22nd last a full-page advertisement appeared in the *Daily Telegraph*, which was subsequently repeated in other well-known daily newspapers with a picture of a lamp bearing the words "Welsbach," "Aur," and "Remember that the electric metallic-filament lamp was invented by Baron Welsbach, and see that the trade mark 'Aur' appears on every lamp." There was also an offer to supply the lamps in exchange for other lamps, and only charge the difference in the cost of the customer's electric lighting for the quarter ending December, 1909, compared with the corresponding quarter last year. At the foot of the advertisement was the name of the Welsbach Gas Lighting Co., Welsbach House, Gray's Inn Road. Those statements, submitted Mr. Isaacs, in conjunction with the picture, were calculated to lead persons to believe that the lamp which the defendant company was thus offering, was a lamp which had been either invented or manufactured by Baron Welsbach, whereas that was not true. Subsequently a Mr. Hale went to the Welsbach Co.'s premises in Gray's Inn Road, and saw a young lady who was in attendance upon customers. Having read the advertisement, he asked for the lamps as advertised, and asked whether they were the Welsbach lamps, and the young lady answered "Yes." Afterwards he saw a salesman and asked the same question, and received the same reply. Mr. Hale thereupon bought two lamps for 5s. 5d. Later he went and purchased 18 more lamps, and received an invoice upon which the lamps were described as "Baron von Welsbach lamps." Having dealt in detail with the sections of the Act under which he contended the defendants had made themselves liable, Mr. Rufus Isaacs said that was as far as they proposed to go that day. There would be only one formal witness, and then they would ask for an adjournment.

A clerk from the office of the Registrar of Joint Stock Companies was called, and proved the registration of the defendant company.

Mr. Walton intimated that there would be a good deal of technical evidence, and he was going to submit that no case had been made out.

Mr. Isaacs remarked that it would be better to hear the evidence first.

The hearing was adjourned.

Blackpool Tramroad Co. *v.* Fleetwood Urban District Council.

The Blackpool and Fleetwood Tramroad Co. were the appellants and the Fleetwood Urban District Council were the respondents in an appeal heard at the Preston Quarter Sessions on Thursday last week. The question at issue was whether a length of tramway rated at £467 should be treated as a tramway and rated as a railway at one-quarter of the full rateable value.

According to Mr. Sutton, who appeared for the respondents, two distinctive things were authorised under the private Acts of Parliament of the Blackpool and Fleetwood Tramroad Co. One was a tramroad 6 miles 5 fur. in length, and the other a tramway a little over 5 fur. long in Fleetwood. In a previous case of the appellants, the House of Lords directed that so far as their line was a tramroad, the company was entitled to exemption, and ought only to be rated to one-quarter of the full rateable value. That had been done, and the rate of £2,232, which had been previously laid upon the company, was divided, thus leaving the "tramroad" rated at one-quarter, but the tramway at the full rateable value of £467.

Against the latter assessment the appeal was laid. The appellants held that although it was a tramway they were entitled to the exemption given to railways.

For the respondents, Mr. Sutton submitted that a tramway was not a railway, the test being what it would be described in ordinary language. The rails did not project above the road and were laid in the public streets, whereas in a railway the rails were raised above the ground and on private property. He contended that if the Court decided that the Fleetwood Co. was entitled to an exemption, every tramway in the country could be treated as a railway.

Mr. Worsley Taylor, K.C., said if he decided in this case that the tramway was a railway, and the decision was upheld by the House of Lords, the result would be to turn over three-quarters of the rating of the tramways belonging to public authorities.

"Tramroad" and "tramway," contended Mr. Hodgson, for the appellants, meant practically the same thing. In the present undertaking they had through booking, and the same carriages ran from one end of the undertaking to the other.

The Bench reserved judgment, and Mr. Worsley Taylor intimated that his decision would be given on November 29th.

Sequel to Fife Pit Explosion.

Sheriff Shennan, Kirkcaldy, has given judgment for £350 as damages, with the expenses, in the case of the pit repairer who sued the Fife Coal Co. for injuries sustained in an explosion of inflammable gas in the Mary Pit, Lochore. The explosion, it was alleged, was due to a spark from a motor used in connection with an electric fan for ventilating the pit.

Holmes *v.* Associated Newspapers, Ltd.

(*Concluded from page* 653.)

Called for the defence, Mr. James Swinburne said he had made a particular study of electricity, and had considered the documents in the case, including the plaintiff's specification, also what the defendants said had gone before, and the defendants' machine. Various appliances had been in use, or tried, for printing machinery, and amongst others was that known as the Ward-Leonard system. As an electrician, he could not see that there were any advantages set forth in the plaintiff's specification other than those which followed from the use of two motors as distinct from one motor. Having described the defendants' arrangement, witness said he had not found, reading through the plaintiff's specification, anything which to him, as an engineer or an electrician, would give him any idea that he had in mind the wish to avoid the gentle reversal of pressure of the teeth in such an arrangement as described by Mr. Dugald Clerk. There was nothing stated about it at all. There was no invention in an electrician or mechanician coupling his machines in series.

Supposing that prior to 1898 electrical driving was perfectly well known, in your opinion would there have been in 1898 any invention in merely driving that machine by the motors instead of by two sets of pulleys?—None at all. There would have been no invention in 1881.

His Lordship: Supposing that the printing press had never been driven by electricity before, and somebody made a machine which

worked satisfactorily—which substituted motors for the pulleys and belts—that would require originality, would it not?—No, my lord; because it was directly understood, since there have been electric motors, that an electric motor can in every case take the place of a belt with advantage.

Referring to claim 4 of the plaintiff's specification, WITNESS said that every specific thing claimed there was *per se* old.

Cross-examined by MR. WALTER: In 1898 a system by which you could use a high-speed motor for the purposes of slow driving was an advantage, chiefly, not because of efficiency, but because of the price. Slow-speed motors were not only more expensive to make, but they were more wasteful in current. The only system he found in the whole of the plaintiff's specification was a system of coupling electric motors plus controlling adjuncts.

PROF. CHAS. VERNON BOYS gave evidence, generally bearing out the evidence of the last witness.

In summing up the case for the defence, MR. ASTBURY said his contention was that everything in the plaintiff's invention was to be found in the earlier American specifications. In both you had all the parts which the switchboard was to operate, and when you did operate them you got all the same results in both.

MR. JUSTICE NEVILLE asked how, in the American machine, the current was cut off in the small motor?

MR. ASTBURY said that it was cut off by a plunger falling down beyond a certain contact, but not until the big motor had overlapped the smaller. The only difference between the American system and the plaintiff's, he submitted, was that in one the two starting-buttons were side by side, and in the other, one was on top of the other. All that the plaintiff had done, he contended, was to take two sides of a switchboard and put them together in a way that required no invention at all. He submitted that the whole of the plaintiff's patent was bad, and, in respect of the only one part that might be the subject matter of a patent, the defendants did not infringe.

MR. KERLEY, following on the same side, submitted that what the plaintiff claimed that his patent would do had been done long before. If the plaintiff had been the first to apply it to electric motors in place of the old belt-drive, there might have been some subject matter for invention; but the principle had been applied to electric motors in the American invention.

MR. WALTER, replying on the whole case, submitted that the defendants had only been able to show similarity between the patent sued upon and prior inventions, by taking the principle only and leaving out all the adjuncts. One feature of the plaintiff's invention was that the starting motor worked with a very small current; that enabled the invention to be worked commercially.

At the conclusion of the arguments, his Lordship reserved judgment.

In giving judgment on Tuesday, his LORDSHIP said that mechanism in which auxiliary driving power was used in connection with the main driving power or mechanism arranged in such a way that the main driving power overtook and then cut out the auxiliary power, was well known. Such a device was used in barring and turning engines, and in the case of printing presses driven by hand and pulley. In the latter case the device was used for, *inter alia*, the purpose of getting a smooth drive from the start, avoiding jerks which were apt to break the paper in the printing press. In such cases, the shaft turned by the small pulley was geared sometimes to the shaft of the main pulley and sometimes to the shaft of the printing press, or, as Mr. Clark put it, sometimes in mechanical series and sometimes in mechanical parallel. "For the sake of brevity, I will adopt these expressions. In the *Western Electrician* and in the *Electrical Engineer* was published before the date of the plaintiff's patent a description of an American motor-driven printing press. In that case two motors were used, main and auxiliary geared to the press in parallel and not in series, the auxiliary motor being used for making ready, and as I read the description for starting the engine, the two motors were so arranged that upon the main motor being started it overtook and, by releasing a clutch, cut out the auxiliary motor. The two motors were operated by separate electrical controls. In my opinion, the only noticeable differences between the mechanism so described and that of the plaintiff's are, first, that in the American machine the motors are geared in parallel, while the plaintiff's are in series, and, secondly, there is a different method of control. A good deal turns upon the question whether the difference between motors geared in parallel and in series is material. The plaintiff's evidence is to the effect that it is. It is alleged that if in parallel back-lash would be occasioned, at the moment when the main motor took up the driving from the auxiliary motor, to the risk of the web. I come to the conclusion on the evidence that no appreciable back-lash could be caused in the American machine, and that the arrangement of the motors in parallel or in series is not a matter of mechanical importance, but rather a matter of convenience having regard to the amount and position of floor space. Upon these findings the question arises whether Claim 1 in the plaintiff's specification is a good claim. As I read Claim 1, it is not confined to the use of an auxiliary motor in addition to, and driving by, power gear through the shaft of a main motor for the purposes mentioned in the claim in connection with the plaintiff's controlling device alone, but in connection with any suitable electrical device for operating the motors. It appears to me that the claim thus construed covers the use of the motors as described in the published description of the American machine in every particular except the arrangement of the motors in parallel. I have already stated my conclusion that this distinction is immaterial, and I think, therefore, that Claim 1 claims the use of mechanism, the use of which for the same purpose had been already publicly described in this country before the date of the plaintiff's patent. It follows, in my opinion, that the plaintiff's patent is bad, and that his action for infringement fails, and must be dismissed with costs."

MR. ASTBURY, K.C.: With regard to the particulars of breaches, I ask your Lordship to certify that they were reasonable and proper.

MR. WALTER, K.C., said a large number of papers had been put forward, but no doubt he and his learned friend could agree what should be included.

His LORDSHIP granted the usual certificate.

FRANCIS & CO., LTD., *v.* WEST HAM CORPORATION.

MR. JUSTICE COLERIDGE and a Common Jury were occupied during the greater part of two days in hearing an action brought by Francis & Co., Ltd., against the Mayor of West Ham in regard to the liability of the West Ham Corporation for an accident to a workman through coming into contact with a live wire connected with the electric tramway service.

Francis & Co., who are blind manufacturers, of 64, Gray's Inn Road, claimed indemnity against the sum of £178 12s. 2d. received from the plaintiffs by the widow of a workman under the Workmen's Compensation Act for the death of her husband, which, it was alleged, had been occasioned by the negligence of the defendants. There was also a claim for indemnity against the cost of the action in which the award was made.

In July, 1908, the plaintiffs were employed by the defendants to execute certain repairs to the tramway-shed blinds at the defendants' depôt in Greengate Street, Plaistow. It was the duty of the deceased workman to place in position a revolving shutter over one of the doors through which the electric cars entered the shed, and owing, it was said, to the negligence of the defendants' servants, the man came in contact with a live wire, and received a shock which knocked him off the scaffold upon which he was standing, and his injuries were such that he died on the following day. Arbitration proceedings were taken under the Workmen's Compensation Act, and the plaintiffs, who were the man's employers, were called upon to pay compensation to the widow, for which they claimed they were entitled to be indemnified by the Corporation of West Ham, as the owners of the tramways. The defence was that the deceased workman at the time of the accident was under the control and direction of a foreman in the plaintiffs' employ, who had been warned of the existence of the live wire and its dangerous proximity to the work which was being done.

Mr. Ashton, K.C., was for the plaintiffs, and Mr. Macall, K.C., for the defence.

The jury returned a verdict for the plaintiffs, and judgment was entered accordingly.

SOME NOTES ON THE MANAGEMENT OF AN ELECTRICAL SHOWROOM.

BY DELTA.

WITH the increase in the use of electrical energy for domestic and other purposes during recent years, there has been correspondingly increased competition with rival systems of illumination. Electrical engineers have found it necessary to include in their organisation a complete and self-contained staff, whose duty it is to disseminate information concerning the advantages attaching to the use of electrical energy. This publicity department is now an important factor in all electricity undertakings, and is presided over by an official trained and fitted for his position. The general methods of publicity campaigns are now well understood. Much has been written on the subject, and it has received the attention of all engineers supplying electricity for domestic purposes. The principles of this important department can now be said to be well established on rational lines, and fairly standard general methods are in operation. In the case of the various sub-departments of the publicity section, it cannot be said that at present there exists that uniformity of practice which indicates a thorough understanding of the subject. The sub-sections forming together, as they do, the whole department, must have given them just as careful study as the broad principles of publicity work, if efficiency is to be ultimately attained. Especially does there appear to exist some lack of understanding, or at any rate, uniformity of idea, as to the precise lines on which the electrical showroom should be run. This state of affairs is, to say the least, undesirable, for the showroom, both in point of view of capital expenditure, and also in cost of working, is the most expensive part of a publicity department. The function of a showroom being in the first place educational, it is important that the very ample means to

this end at the disposal of the publicity manager should be used effectively. Lack of attention to the details of this section of the publicity department will not only, in the natural order of things, decrease its utility, but lead to the undesirable result that the existence and cost of working of it, are not justified by the benefits accruing to the whole undertaking.

The size of the showroom will, of course, be decided within fairly close limits by the amount of capital at the disposal of the undertaking in question. It is important that these premises should not be too large. It is far better to have a small establishment, and spend the money saved on the internal decoration, than to have large premises poorly and barely equipped. The size should be carefully restricted to that which can be adequately or even extravagantly fitted. The showroom will, in the majority of cases, be in connection with the office of the publicity department, and it is of the highest importance that however small the undertaking may be, if it boast a publicity manager, this official should be provided with a private office in which he can interview prospective consumers. A far better effect will be obtained than by a semi-private talk in the showroom, where possibly other people may be. At least one assistant will be necessary in this department, and again, on however modest lines this department is run, the selection of this person should have adequate care. It is not sufficient to have merely an intelligent clerk, or an enterprising shop assistant in this capacity. The man chosen should be thoroughly well acquainted with the class of work with which he has to deal, and should be competent to answer all ordinary questions that may be put to him. Many may be inclined to regard the foregoing statements as superfluous, by reason of their being so obvious, but the writer can assure such persons that he knows of more than one case in which the assistant in charge, for the time being, of a showroom in connection with an important electricity undertaking, was unable to answer the simplest questions having reference to the business. The choosing of all the assistants in this department requires great care, and the salaries should be such that reasonable knowledge of the subject may be expected.

The actual arrangement of the showroom stock will depend, in a large degree, on the particular taste of the publicity manager. Variety should be aimed at in the selection of the fittings to be exhibited, and one particular type should not, as a rule, be unduly multiplied. The great number of lacquered brass fittings to be found in many showrooms does not secure that variety which should be found in an establishment of this kind. It should be borne in mind that wrought-iron and oxidised copper fittings do not cost a great deal more than lacquered brass and are preferred by many people, and for this reason they need not be treated altogether as a side line. A glance at many showrooms also seems to indicate that the general public have a predilection for fittings of the pendant variety, those of the bracket and ceiling type being, in comparison with the others, few in number. The arrangement of the windows should be according to some well thought out plan, and should be changed at regular intervals of time. A showroom that has precisely the same appearance from week to week will soon cease to attract attention, and become "stale." It is advisable to arrange with the contractors who supply the fittings for the showroom, to have these changed from time to time, in order that the appearance of the showroom may be continually altering. This should especially be done in the case of electrical heating devices, as these are many in number, and the purchase of even a moderately representative selection would entail great expense, while if an arrangement is made with the fittings manufacturer the latest types can be continually exhibited.

A question of considerable importance arises at this stage, as to the sale of fittings in the showroom. There are generally two courses open to the publicity manager. In the first place, the showroom can be treated as such literally, and the establishment used merely for the exhibition of those fittings which are likely to find most acceptance among the inhabitants of the neighbourhood, or on the other hand, the department may be regarded in a more strictly commercial sense, and the sale of fittings undertaken. Which of the two courses is adopted will depend, to a large extent, on local conditions, especially on the size of the electricity undertaking. If fittings are sold at the showroom the amount of clerical work necessarily entailed will be considerable, and the trouble ensuing in the frequent case of the publicity department not being adjacent or near to the offices of the department, will by no means be negligible. On the other hand, it will be of inestimable value, in the case of many consumers, to be able to do this kind of business on the spot without the intervention of the manufacturer or local electrician. However, as a general rule, the sale of fittings should not be undertaken in connection with the showroom of an electricity undertaking, except in special circumstances, or in the case of the publicity department being at all extensive. Care should, however, be taken that information as to cost, &c., of any fitting exhibited in the showroom can be at once turned up in the maker's catalogue. It is not sufficient for the assistant merely to give the price, but the person interested should have an opportunity of inspecting illustrations of fittings of similar design. In the case of fittings being sold at the showrooms, the details of such practice fall naturally under the head of business methods, and with such details the writer does not purpose dealing.

The methods of dealing with the various persons who from time to time visit the showroom, call for some comment. The system employed by many publicity managers of having every call recorded is in principle admirable, but the practice which is the result of this system, of the assistant making strenuous endeavours to discover the names and addresses of strangers, when they may not care to disclose them, is of questionable expediency. It should be remembered that the function of the publicity department is to educate the general public to realise the advantages of electric light, and not to persuade them to adopt a particular system of illumination against their will. The showroom seeks to carry out this education in the simplest manner possible by placing before the public actual examples of the superior method. Obviously, a system that has the effect of keeping people away from the showroom is inimical to the interests of the publicity department. The knowledge that he will be bullied by an assistant into leaving his name and address, will often keep a prospective consumer away from the showroom, and cause him to continue to use whatever system of illumination he then has in his house. For this reason the general public should be invited to visit the showroom, and undue efforts should not be made to obtain the names of those so doing, while it is pointed out that such information is requested, and will be gladly received. If this information is supplied, the person in question can, of course, be called upon and carefully looked after in the orthodox fashion until the application form is signed. While bearing in mind the fact that the showroom does not exist for the gratifying of idle curiosity, it should never be forgotten that no custom or rule should be suffered to remain in force that has the effect of keeping the undecided person away.

To say that a showroom should be adequately lighted is to express a platitude, and no publicity manager would be guilty of neglect in this particular. It is, however, possible to be needlessly or even harmfully extravagant in the illumination of these premises. The general public are quite well aware that an excessive degree of illumination can be obtained by the use of any illuminant, provided sufficient money is spent for the purpose. An enormous blaze of light is not a *prima facie* argument in favour of electric light, and is very costly to the department. The superfluity of illumination should also be avoided in view of the fact that this will hinder the display of various fittings, and will also make the premises uncomfortable.

This important department of the modern electricity supply undertaking calls for great and detailed care in its management. There is no reason why it should not be run on lines of thorough efficiency, it being borne in mind that the existence of no department is justified if the result of a long period of working is a loss to the undertaking. Of course, it is impossible to adequately estimate the efficiency of such a department, for many circumstances, out of the control of the publicity section, may hinder an otherwise willing consumer from being connected. The cost of working the showroom should be as rigorously studied as in the case of the generating station, for unprofitable extravagance and

waste can easily occur. Above all, the showroom should be up to date, and any new electrical device on the market should be exhibited as soon as possible. Progress and economy are two cardinal maxims in modern business methods, and in no commercial enterprise will the observance of these contribute more directly to efficiency than in the case of the electrical showroom.

BUSINESS NOTES.

Consular Notes.—Turkey.—The British Consul at Salonica reports that the electric tramway in that town, which began running in June, 1908, has survived several attacks of the strike epidemic, and now has no competitor in the shape of passenger steamboats, all except one having returned to Constantinople. In 1909 a few additional tramcars will be imported. Something is at last being done by the municipality to improve the lighting of Salonica. The electricity will be supplied by the dynamos which drive the electric cars. The wires will be carried overhead, and for this purpose 211 tapering trellis-pattern standards of Belgian iron of an average weight of 1,760 lb. are to be used. Private consumers still seem to be deterred by the tariff—70 c. per unit—though this compares favourably with European rates; and the Consul has been assured it is to be the maximum rate. So far three theatres and a big flour mill are the only instances of private electric installations. Three of the four main arteries of Salonica will shortly be lighted by electricity, as well as one or more of the principal cafés. The telephone is in use in the Custom House, the offices of the Provincial Government and the Inspectorate-General, and the police-stations are also linked up by telephone. The instruments are being imported chiefly from Germany.

The British Consul at Smyrna reports that application has been made to the Government for the concession for the right of exploiting electric lighting and traction in Smyrna and suburbs. In this connection the Consul calls attention to the Official Programme of public works, issued by the Imperial Ottoman Ministry of Public Works, which deals with this amongst other projects. The book (printed in French) may be consulted at the offices of the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C. That British merchants and manufacturers, and even financial houses, are taking a more active interest in the trade of Turkey is evidenced by the Press reports and by the increased number of inquiries reaching the Consulate-General. Most of these inquiries are for names of local dealers in the special article or articles in which the home merchant or manufacturer is interested, or for those of suitable agents. Suitable answers are duly supplied to these inquiries, but it may not be amiss to observe that in most cases the information sought for is already in the possession of the Commercial Intelligence Branch of the Board of Trade, a direct or first application to which would very often mean a saving of time to the inquirers. The recently established British Chamber of Commerce in Smyrna ought to prove of additional service to British merchants and manufacturers disposed to extend their businesses in Smyrna.

A Tantalum Smoker.—A smoking concert was held at the Crown and Castle Hotel, Dalston, N.E., on Friday last. Mr. A. D. Hunter was in the chair, and a number of visitors were present, including Mr. S. Green (St. James' and Pall Mall Co.), Messrs. R. E. Pooley and Clifford Austin, Mr. H. E. Harrison (Great Northern and City Railway), and Mr. Lidgey (of Messrs. Siemens Bros., Cardiff branch). The programme was provided chiefly by the joint staffs of Messrs. Siemens Bros.

Exhibition Awards.—The Cowper-Coles Engineering Co., Ltd., have been awarded by the juries for the different sections of the Imperial International Exhibition a Diploma for Grand Prize in connection with their metallurgical and electrochemical exhibits, and a Diploma for Gold Medal for Mechanical Engineering; also a Diploma of Honour for Applied Chemistry.

Bankruptcy Proceedings.—The affairs of Laing, Wharton & Cunnington, electrical engineers and contractors, 7, Great Newport Street, St. Martin's Lane, W.C., were again before Mr. Registrar Giffard at the London Bankruptcy Court on Wednesday last week. It will be remembered that, in the preceding week, Harry Pigott Allison, a member of the firm, was granted an order of discharge, subject to a judgment for £200 being entered against him. Mr. Hansell, for the debtor, now asked that the £200 should only become payable from any surplus income above £400 a year, on the ground that his client could not properly earn his living under that amount owing to the character of the business in which he was engaged. Mr. W. P. Bowyer, assistant Official Receiver, suggested that £350 per annum was amply sufficient for the debtor's expenditure, and that anything beyond that amount ought to be handed over to Mr. Alfred Page, the trustee under the bankruptcy, to be placed against the amount of the judgment. Mr. Hansell agreed to the amended sum, and said his client would file an account of his income every six months, until the judgment had been satisfied. The order of the previous Wednesday was amended on those terms.

E. A. Brandon, electrical and mechanical agent and factor, trading as E. A. Brandon & Co. at 33, Devonshire Chambers, Bishopsgate Street Without, E.C.—The public examination of this debtor was to have been held on Wednesday last week. The statement of affairs showed total liabilities £2,107, of which £1,137 was expected to rank against assets valued at £8 1s. 8d., after deducting £14 16s. 6d. for payment of the preferential claims. The case was not reached at the rising of the Court, and the hearing was adjourned until November 10th.

S. E. Smith, electrical engineer, Lincoln.—A receiving order was made on October 19th on a creditor's petition. First meeting and public examination, November 4th, at Lincoln.

Eric Eaton, electrical engineer, Ashton-under-Lyne.—First meeting, October 30th; public examination, November 18th—the former at Manchester, the latter at Ashton-under-Lyne.

Ernest Goodman, electrical engineer, Coventry.—A receiving order was made on October 22nd, on debtor's own petition.

Trade Announcement.—Mr. George Ellison has just completed extensions to his works at Warstone Lane, Birmingham, which have been made owing to increased business.

South African Order.—Messrs. Andre Citröen and Co., of 19-21, Queen Victoria Street, have just received a £3,000 order for their machine-cut double helical gears in connection with South African hoists.

Stirling Boilers.—The following are among the orders that have lately been received by the Stirling Boiler Co., Ltd.:—

Two Stirling boilers for the Indian State Railways (Oudh & Rohilkund Railway).
Boiler for Copenhagen Tramways.
Boiler, chain grate stokers and superheater for the Newcastle and District Electric Lighting Co.
Boiler, superheater and chain grate stoker for the Borough of Partick.
Two boilers and superheaters for Fulham Electricity Works.
The foregoing are all repeat orders.
Order for boiler, superheater, and chain grate stoker for Ashton-under-Lyne Electricity Works.
Order for boiler fired with waste gases from destructor for the General Post Office, Mount Pleasant.

Besides the above, orders for many large boilers for important paper works, chemical works, cotton mills, oil works, sugar refineries and other general manufactories are in hand.

Renovation of Glow Lamps in Germany.—The attention of the Imperial Chancellor was recently drawn to the opinion, as expressed in newspaper advertisements, that glow lamps can be placed on the market, without payment of the lamp tax, which have been reconstructed either by the insertion of new filaments or by the cleaning of the blackened bulbs, followed by re-exhausting of the lamps, the contention being that these operations do not represent manufacture within the meaning of the law in regard to the taxation of illuminating articles. As the Prussian Minister has just informed the chief revenue authorities, this view of the question is based neither upon the law nor upon the technical conditions. Both lamps whose filaments have been burnt through and those which have become blackened, are technically designated as used. If they are again made capable of service, this is regarded as equal to the manufacture of new lamps, and these lamps are to be taxed as new lamps as soon as they are removed from the rooms of the establishment in which the construction or the reconstruction has taken place. In addition to this, lamps which become unserviceable before use, perhaps during dispatch, or shortly after being placed in use, cannot be put on the market after reconstruction without being subject to taxation, as compensation for the tax in the form of a lump sum to manufacturers is provided for in the case of lamps which become unserviceable in this way.

Book Notices.—*Elektrische Uhren.* By Dr. A. Toblen and J. Zacharias. Second revised edition. Vienna: A. Hartleben. Price M 3.—This book was originally published some years ago, but has now been practically re-written, as the subject of electric time service has advanced more than most other branches of electric work, more especially in connection with the maintenance of public clocks. After a short historical introduction, the writer proceeds to a detailed description of the various electric devices employed in connection with clocks. Chapter I deals with driving mechanisms (electrically influenced pendulums, electric winding devices, &c.) and with contact-making devices. Chapter II describes the electric distribution of time to the various parts of a town, district or country. In Chapter III electric chronographs, time-registering devices and other scientific instruments are described, and in Chapter IV a useful descriptive catalogue of the various patents taken out in connection with electric clockwork between 1877 and 1909 is given. This list is divided into seven groups: (1) Self-contained electric clocks and clock installations; (2) electric clocks controlled from a distance; (3) circuit arrangements for electric clocks; (4) devices for setting the hands of electric clocks; (5) regulation devices; (6) electric striking mechanisms; and (7) electric winding and contact-making devices. The book is comprehensive and fairly up to date, although a good deal of obsolete material has been retained from the older edition. The treatment will appeal more to those engaged in the work than to students, as there is much more detailed description of actual constructions than critical comparison of typical arrangements.

Fowler's Mechanics' and Machinists' Pocket Book and Diary, 1910. By W. H. Fowler, Wh. Sc. Manchester: Scientific Publishing Co. Price 6d. net.—This is the second edition, and has been considerably extended in scope and contents; it contains a great store of information for machinists, and strikingly illustrates the great changes which have taken place in workshop practice during the last 20 years. Numerous tables and data are included, and the book will no doubt be as popular as the other handbooks emanating from the same source.

Arithmetic of Electrical Measurements. By W. R. P. Hobbs. Thirteenth edition. London: T. Murby & Co. 1909. Price 1s.—

In this book a large number of problems are given which involve the application of Ohm's law, Lenz's law, and other fundamental principles of electric technology—some of them being derived from City and Guilds examination papers. Numerous examples are fully worked out, and brief explanations of the governing conditions are included. The book should be useful to students as affording practice in such calculations. Answers are appended to the questions.

Standard Dimensions for the Threads of Sparking Plugs. Engineering Standards Committee (Report No. 45). London: Crosby Lockwood. Price 2s. 6d. net.—The Committee's investigations have shown that the general practice in making sparking plugs is to employ a thread similar to that originated by Messrs. De Dion-Bouton, having 17 threads to the inch (corresponding to a pitch of 1·5 mm.). This thread is so extensively used in this country for sparking plugs that considerable difficulty would be experienced by manufacturers in adopting any other standard, and it has therefore been adopted by the Committee. The Report gives the dimensions of the thread on the plug itself, the tap for cutting the thread to receive it and the gauges for both the plug and the female thread. It is the Committee's intention to hold a conference in the near future with the automobile societies in order to draw up an alternative standard of larger diameter, which will permit of a more satisfactory design for the sparking plug.

Everybody's Story Magazine, November.—This is the first issue of a new 4½d. magazine, issued by the Religious Tract Society, for which there has been a very large demand already, and the machines are still running. It contains a number of complete short stories, forming very readable fiction for the railway traveller or for our voteless folk at home.

British Standard Specification for Ammeters and Voltmeters.—The Engineering Standards Committee (Report No. 49). London: Crosby Lockwood. Price 2s. 6d. net.—In this specification, instruments are classified as sub-standards, first grade and second grade instruments, according to their accuracy. The second-grade instrument, having a not very high order of accuracy, is suitable for workshops and similar places where accuracy is not of vital importance. The Committee make certain definite recommendations for the construction of instruments, and standard scale readings for ammeters and voltmeters have been adopted, reducing the number of scales which have to be kept in stock. The drop in pressure on the shunt has been standardised, in order to obtain interchangeability; its value is different to the German standard. The transformation ratio of a pressure transformer has been fixed, as well as the current in the secondary circuit of a series transformer. The Committee intends dealing in a separate report with standards for instrument transformers, resistances and separate shunts. The question of accuracy has necessitated a great deal of investigation and prolonged discussion, on account of the inherent differences in the various types of instruments, as well as the degree of accuracy attainable under practicable working conditions. The difficulty of expressing in a simple manner the permissible limits of error when these had been decided upon gave the Committee a considerable amount of preliminary work before a useful result was attained, and we are assured that the figures for the accuracy are based on actual "test records" supplied for the use of the members.

Examination Questions in Electrical Engineering. By a Certificated Teacher. London: S. Rentell & Co. Price 1s. net.—This little book gives the questions set by the City and Guilds Institute at its examinations in the title subject since 1900, with answers where these are numerical; complete answers and illustrated solutions are given for the questions set in 1908. In spite of the possible suggestion that books of this kind aid "cramming," there is no doubt that they are of great assistance to both student and teacher: to the former by enabling him to test and exercise the knowledge that he has acquired, and to the latter by providing him with a store of suitable questions for home work. Many students of considerable ability undoubtedly fail to convey to the examiner a due sense of their attainments simply because they have not acquired the knack of answering examination questions in the most efficient way; these will find the fully worked examples most helpful, and we understand that in future issues of the book full solutions will be appended to all new questions. So far as we have tested the solutions they are correct, and the book is well printed.

"Electrical Engineering." By C. P. Steinmetz. New York: McGraw-Hill Book Co. 1909. Price $4.00 net.

"Radiation, Light and Illumination." By C. P. Steinmetz. New York: McGraw-Hill Book Co. 1909. Price $3.00 net.

Effect of Strike in Sweden. — According to the Swedish industrial journal, *Norden*, a striking example of the disastrous effect of the great strike on the Swedish industry is found in the statement of the proprietor of the Scandinavian manufactory of incandescent electric lamps at Nyköping, that his firm lost a contract for the delivery of 300,000 incandescent lamps to a German firm. Owing to the new Bill introducing a tax on electric light in Germany, it was in the interest of the manufacturers and the wholesale, as well as retail, trade to supply their customers, or all consumers of electric light, with as many lamps as possible before October 1st. His firm thus received an order for 300,000 lamps, but the strike commenced, unfortunately, and the result was that only 20,000 lamps were delivered.

Electrical Smelting.—The Swedish Iron Commission, appointed by the Government, a short time ago appointed a Committee with the object of going into the question whether the Commission ought to provide the necessary capital for carrying on experiments on the electrical smelting of iron ore, not only for the purpose of attaining a practical solution of the problem, but partly, and perhaps chiefly, with the view of being able to make practical demonstrations of the processes and furnaces before iron masters and other representatives of the iron industry, so as to call their attention to the advantages of the electrical process. It is estimated that a sum of 250,000 kr. (£13,833) is required in order to build the plant and to carry on the experiments long enough to ascertain the economical results.

Charge of Stealing Lamps.—At St. Helens on October 20th, Frank Hammond, *alias* Dr. Kerr, George Frank Blease, F. Taylor, &c., was charged with stealing 40 electric lamps from the London and North-Western Railway Station. Accused had been employed at the New Brighton Tower as an electrician, and he obtained the lamps by representing that he had been sent for them by the Rev. Father Proctor, to whom they had been consigned. He then sold 29 of the lamps to a Warrington tradesman by stating that they were a bankrupt stock. Prisoner was sentenced to six months' hard labour. At Warrington, on the previous day, Hammond was sentenced to three months' hard labour for stealing, by means of a trick, six electric globes, value 18s., the property of Mr. H. Bibby, 13, Arpley Street, and obtaining by similar means two electric globes, value 6s, from Mr. T. Daintith, 121, Bridge Street.

Catalogues and Lists.—The Electric and Ordnance Accessories Co., Ltd., Cheston Road, Aston, Birmingham.—Twenty-four-page illustrated catalogue (No. F79), in which they set out very fully particulars of their "Eclipse" electric heaters. Special attention is devoted to the convector patterns, and some very acceptable designs are shown for different classes of buildings. Circular patterns, electric car and train heaters, wall and cylindrical type heaters, factory heaters, &c., are represented, catalogue numbers, code-words, prices and sizes being given. A small section of the catalogue is devoted to glow lamp radiators. Two small folders have also been received, one relating to these heaters, giving sizes, prices, &c., the other giving prices, &c., of the "E.O.A." metal-filament lamps. Contractors who apply to the firm expressing the wish can have a quantity of these folders with their own name and address printed thereon.

The Electrical Trades Supply, Ltd., Britannia Works, Great Charles Street, Birmingham.—Twenty-four-page catalogue, in which they set out numerous illustrations, with prices, &c., of a variety of E T.S. porcelain and stoneware insulators and cleats, ironwork for insulators, tools for line construction and general electrician's service, also various sundries.

The Sunbeam Lamp Co., Ltd., Park Road, Gateshead.—From this company we have received a number of publicity novelties, postcards and other things setting forth the claims of the Sunbeam metal lamps, which "give the best light in the world," and "save 14s. in the £ on your lighting bill." A neat hanging show-card effectively represents the bowels of the earth brilliantly lighted by one of these 220-volt lamps—the candle-power is not stated. Copies of all this advertising matter are being distributed broadcast amongst the trade.

The General Electric Co., Ltd., of Queen Victoria Street, E.C., seems to have a never-ending variety of novelties in its Wonder Box of Publicity. The saving in one's lighting bill and the additional flood of light when using Osram lamps, as compared to when one used carbon-filament lamps, is easily seen by operating the cardboard switch on the card just received.

Messrs. Baxendale & Co., Miller Street, Manchester.—68-page catalogue detailing, with an abundance of illustrations, their various telephones and telephonic manufactures, fire alarm apparatus, wires and cables, batteries, insulators, &c. A number of pages are occupied with clear diagrams of connections.

Messrs. Falk, Stadelmann & Co., Ltd., 83-87, Farringdon Road, London, E.C.—The plaster bust of "Mephistopheles" with which this firm have long made the "Efesca" metal-filament lamp familiar to electrical men and consumers, has in the publicity efforts of the makers taken upon itself a cardboard cut-out form. This cut-out is designed to carry suspended from the Mephistophelian hand an actual lamp, and it is for counter or shop-window display. Being less expensive to produce than the plaster busts, the new device can be distributed more freely, and Messrs. Falk, Stadelmann are prepared to supply one or more to any electrical contractor or dealer who will communicate with them. They are not discontinuing the use of the plaster cast, which they supply to their more regular "Efesca" lamp customers.

Messrs. S. W. Martyn & Co., 11, Pratt Street, Camden Town, N.W.—Two pocket lists; one entitled "What a Nice Car!" particularising regarding the firm's motor-car business; the other, entitled "An Imitation," drawing attention to their electric lighting, heating and cooking and other installation work.

Mr. George Ellison, Birmingham.—Illustrated and priced leaflets; No. 102, describing oil-immersed three-phase rotor-starters; No. 221, detailing their oil-break circuit-breakers; also an attractive date-card for November.

The Cable Accessories Co., Ltd., Britannia Street Works, Tividale, Staffs.—Illustrated list of 16 pages giving particulars of their electric light cast-iron water-tight fittings, &c., for collieries, factories, mills, street and general lighting. Hand lamps, cluster light fittings, arc-lamp winches and other tackle, fuse boxes and sundries, are noted.

Messrs. Mibblees Watson Co., Ltd., Scotland Street, Glasgow.—A number of new publications have just been issued. The chief is a 20-page finely illustrated catalogue of independent condensing plant, the relative merits of the three following types being dealt with; surface condensing (counter-current or contra-flow); jet condensing (elevated self-draining counter-current type); jet condensing (low level counter-current type). Photographs and line drawings are included of a number of installations that have been put into different works, electrical and other. The

other publications are devoted to the following subjects: Condensing plant for rolling-mill engines at the steel works of Messrs. David Colville & Sons, Ltd., at Motherwell; surface condensing installation at Leeds Corporation electric lighting station; utilisation of exhaust steam on the Rateau system; tabulated list of independent condensing plants installed by the firm; two surface condensing installations at Pretoria, S. Africa, and at Meerut electric power station, in India; jet condensing plant at a Scottish Co-operative Works; condensing plant for blowing engines at the Workington works of the Moss Bay Hematite Iron and Steel Co., Ltd.; surface condensing installations supplied to the Lancashire Electric Power Co. and the Yorkshire Electric Power Co.; and the Mirrlees-Edwards air pump. All of these pamphlets are of uniform size, and are executed in very good style on art paper.

Messrs. H. G. Mayer & Co., 67, Aldersgate Street, London, E.C.—New price list of "Plania" carbons for open, enclosed and flame arc lamps.

LIGHTING and POWER NOTES.

Bath.—The Electric Lighting Committee is desirous of extending the area of supply to within a radius of 3 miles from the Guildhall, and it is intended to interview the representatives of the Somerset Power Co. respecting the cession of its powers.

Bedford.—The T.C. has received from the L.G.B. sanction to a loan of £630 for street lighting by electricity.

Berkhamsted.—The U.D.C. has executed an agreement with the Chesham E.L. and Power Co.

Bradford.—At a recent meeting of the City Council, the annual report of the city electrical engineer was adopted. This points out that it is hoped to have the first turbine extension running in a few weeks, and the second a month later. The beneficial effect of reductions made two years ago in the rates for power and heating, and of the special terms offered to consumers taking a bulk supply, is now being felt, the units supplied to consumers affected by these rates having risen from 2,697,381 during the year ended June 30th, 1907, to 5,039,274 in the year ended June 30th last. Both hired and purchased motors are on the increase, whereas, previously there had been a falling off. Some fear is expressed as to the immediate future as regards lighting revenue, owing to the universal adoption of metallic-filament lamps; the units sold for lighting during the past half-year are less than those sold during the half-years ending June 30th, 1907-8. The total number of consumers has increased from 2,313 to 2,457. Considerable economies in production are expected when the turbine plant is in service, and also as a result of advantageous coal contracts.

Brighton.—The borough electrical engineer is recommending the purchase of a fifth turbo-alternator for the Southwick generating station, owing to the increasing demand for electricity.

Bushey.—Watford U.D.C. is taking steps to ascertain the probable number of consumers for E.L. in the area of the Bushey U.D.C. If the demand warrants it Watford will, with the consent of Bushey U.D.C., apply for a prov. order.

Canada.—The parish of Pointe aux Trembles, says the *Canadian Engineer*, has awarded to the Saraquay Electric and Water Co. an exclusive franchise for electric light and power over a territory of 35 square miles on the Island of Montreal. A correspondent states that the company is about to install an electrically-driven water-works pump with a capacity of 1½ million gallons per day, also six 250-kw. 11,000-volt transformers. A contract for a 500-kw. steam turbo-generator has been placed with the Canadian General Electric Co.

Continental Notes.—Sweden.—A meeting was recently held at Stockholm at which some of the most prominent and well-known landowners and representatives of industrial circles were present, when it was decided to form an association under the name of the Swedish Water-power Association. The object of this association is to form a central body, which will be able to further the joint interests of the owners of the waterfalls. As the development of the electrical industry in connection with the waterfalls makes new legislation for the regulation of the rivers and the waterfalls absolutely necessary, the Association will be able to represent and to protect the interests of the owners in a way that will carry great weight, when the new law is drawn up. It is further intended to assist the members with information and advice, and to make the waterfalls and everything connected therewith a matter of special study. In Norway invitations to attend a meeting in order to discuss the formation of a similar association have been sent out by men interested in the matter.

The Hellefors Ironworks Company has just placed with the New United Electric Company the orders for the entire electric equipment of the just completed extension of its works. It comprises five large three-phase generators, and transformer station complete with the necessary apparatus. The grinding sheds will be driven by the biggest electric motor so far used in Sweden—an asynchronous three-phase motor of 2,700 h.p. at 210 r.p.m. For driving he accessory machinery of the grinding sheds, there will also be nstalled a similar motor of 400 h.p.

Switzerland.—The Electricitäts Genossenschaft is the name of a new concern which has lately been organised at Sins (Meienburg) to establish a central station in the town for the supply of electrical energy for lighting and power purposes.

Belgium.—La Société des Forges et Laminoirs de Baume has decided on the establishment of a large new electric power plant, at an estimated cost of £14,000, for the driving of the rolling mills at its works.

Crompton.—The U.D.C. has decided that whenever there is a specific application for electricity, Oldham T.C. shall be allowed to supply it, subject to the Council's future interests being safeguarded.

Falkirk.—A note in our issue of October 8th under this heading, dealing with the Corporation electricity undertaking, made it appear that after paying interest, &c., there was a clear profit for the year of £953. We have since received an abstract of the accounts of the T.C., and find that after paying interest a balance of £999 remained, but after meeting sinking fund, bad debts, taxes, &c., there was a deficiency of £316—this sum, however, including £227, the cost of procuring the provisional order, which had appeared in the capital account.

Frodingham.—The U.D.C. has decided to apply for a prov. order for E.L. The Council has already arranged to light the streets by electricity.

Fleetwood.—The U.D.C. has decided to pay its clerk the sum of 50 guineas for extra work—legal and Parliamentary—done by him in connection with the acquisition of the electricity undertaking, the said amount to be included in the next loan.

Llanelly.—An electrical plant is being installed at the Morfa Tinplate Works for providing power in the cold-rolling department. This is a new departure in the neighbourhood.

London.—Stepney.—The new generating station of the Borough Council, situated at Blyth's Wharf, Limehouse, was opened by the Mayor on Wednesday afternoon last. The new plant will have many advantages over the original station at Osborn Street, not the least being sea-borne coal and ample condensing water, whereas at Osborn Street the plant is necessarily non-condensing and all fuel carted. The buildings are of steel and concrete—provision being made at one end for extending them. The boiler house contains an initial installation of three water-tube boilers, and space remains for four more. One boiler of 22,000 lb. per hour capacity is fitted with Underfeed stokers and forced draught, and the two smaller ones with chain grates and induced draught. The bunkers will accommodate 1,000 tons of fuel, which will eventually be handled mechanically over the river wharf. Steam is supplied to one 2,000-k.v.a. Willans-Parsons turbo-alternator and one 1,000-kw. Parsons turbine with two generators in tandem, this plant being similar to one installed at Osborn Street, which is to be removed to the new building shortly. Both turbines are equipped with contraflo condensers and air pumps, the circulating water being obtained from two river wells equipped with Rees-roturbo circulating pumps and piping arranged on the Bowden patent system, as described by us in connection with the South Metropolitan Electric Light and Power Co.'s station at Greenwich (see Electrical Review, August 2nd, 1907). The larger turbine unit generates three-phase current at 6,600 volts, and in the case of the smaller machine, the output is transformed up to this pressure, the machines being controlled by e.h.t. switchgear of the Reyrolle ironclad type installed in a gallery. Similar switchgear is provided at Osborn Street, where motor-converters are installed to convert and transform the h.t. a.c. supply to direct current at normal pressure; the Merz-Price patent system of control is installed in connection with the e.h.t. switchgear. The l.t. boards are of Messrs. Crompton's make. The total length of mains now laid in Stepney amounts to 150 miles; the borough has a river frontage of 2½ miles, almost the whole of which is lined with large warehouses, &c., and it is anticipated that these will take a large supply in the near future. The electrical and mechanical equipment has been installed to the design, and under the supervision of, the borough electrical engineer, Mr. Wm. C. P. Tapper.

City.—At the last meeting of the City Corporation, the Streets Committee brought up a report relative to the notice (already mentioned in this paper) of the County of London Electric Supply Co., of its intention to commence the laying of electric mains in various important streets. It was agreed to give notice that the proposed works were disapproved of. An application was received by the City of London Electric Light Co. for permission to lay mains in King William Street, Lombard Street and Creechurch Lane. The required permission was granted subject to the works in King William Street and Lombard Street being commenced after six o'clock on a Saturday evening and continued continuously during Sunday. If not then completed, the trenches are to be filled, and operations are to be resumed on the following evening. The Streets Committee is to arrange for some further experimental lighting in the thoroughfares, as suggested in the report on the recent inspection of various systems of public lighting on the Continent.

Hamstead.—The recent electrical exhibition was visited by 12,000 persons.

Hammersmith.—A referee having been appointed by the B. of T. to inquire into the complaints as to the condition of the London United Tramway tracks, the Council's solicitors have been instructed to retain counsel and obtain expert engineering assistance. The authorities of the Shepherd Bush Exhibition wrote to the Council expressing a desire to enter into a contract for the supply of three-phase current for the remainder (four years) of the contract period. The Council communicated with the

Kensington and Notting Hill Electric Lighting Companies, from whom it purchased the current, with the result that the companies, with the exception of a few minor modifications, to which the Exhibition authorities are willing to agree, are prepared to enter into a contract to give the supply required upon the same terms as those under which the present supplementary three-phase supply is given. The Electricity Committee directed the attention of the Works Committee to an experiment which had been tried in the lighting of the Grove by substituting for one of the existing arc lamps a 400-c.p. "Osram," with clear glass globe. The annual cost to the electricity undertaking for lighting the Grove by arc lighting, is £138, compared with £92 18s. 6d. for the incandescent lighting, and the cost of the conversion is estimated at £20 11s. 4d. Having regard to the saving to be effected, and the increased lighting efficiency to be gained, the system of lighting the Grove is to be converted as suggested.

The East London Electrical Exhibition, to which we referred last week, closes to-morrow; we understand that it has resulted in good business in electric plant, motors, &c.

The Finsbury librarian reported at the meeting of the Council on October 21st that the introduction of Osram lamps at the Central Library in May last had caused a saving in the cost of current amounting to £14. Taking into consideration that the period covered was the lightest portion of the year, it was not too much to believe that when there was a complete installation of Osram lamps at the Central Library and branches, the saving in the cost of current would be at least £80 per annum.

Some details of the new Post Office power station on the Surrey side of the Thames at Blackfriars were contained in a recent issue of the *Times*. The new plant will supersede three existing installations; it is housed in a brick and steel structure, and will include, in the first instance, three Willans-Dick, Kerr turbo-alternators, one of 500-kw. and two 1,000-kw. capacity. The plant is to operate on 17 lb. steam per kilowatt-hour (presumably at full load), and will generate at 6,600 volts pressure. A small Willans steam dynamo and a B.T.-H. motor-generator are provided for excitation. The main switchgear is of Westinghouse type, and other adjuncts are a 20-ton three-motor traveller in the engine room and coal-handling and conveying plant by Babcock & Wilcox. Seven Stirling boilers are installed, three of the land type, each of 20,000 lb. per hour capacity, and four of the marine type, each of 17,750 lb. per hour capacity. The fuel will be bituminous slack, which will be burnt in chain grate stokers. Duplicate cables couple the plant with sub-stations in the main Post Office buildings, where the supply will be transformed down to 440, 220 and 110 volts for general use. The 40 miles of pneumatic tubes radiating from St. Martins-le-Grand require some 500 h.p. for their operation, and the numerous lifts, conveyors, and other applications in addition to lighting will ensure a good load for the new plant.

Macclesfield.—It is understood that the B. of T. has intimated to the T.C. that it proposes to revoke the E.L. order, and in consequence the General Purposes Committee, which has discussed the matter *in camera*, has recommended the Council to empower the Gas Committee to prepare plans and estimates for the supply of electricity within the borough.

Methley.—The U.D.C. has granted permission for the Yorkshire Electric Power Co. to pass through the district with overhead lines for the purpose of supplying energy to the Castleford district.

Rawtenstall.—The Globe Spinning and Manufacturing Co., Ltd., has applied to the T.C. for a supply of 1,500 h.p. for driving the works.

Rotherham.—The T.C. has decided to apply by a Parliamentary Bill for power to supply electricity in the Tinsley district, to lay a feeder and distributing main in the Broom district, and to borrow £5,000 for small extensions of mains and additional services.

A Scottish Deputation. — Representatives of the Glasgow, Edinburgh and Partick Corporations interviewed Mr. Tennant, of the B. of T., on October 20th, with regard to the Electric Lighting Acts Amendment Bill. A new clause safeguarding the rights of public bodies supplying electricity was discussed, but another conference will be held before the proposed amendment to the Bill takes final shape.

Sheffield.—An Electrical Exhibition, arranged by the Electric Supply Department, was opened on the 14th inst. It is essentially a domestic electrical exhibition, and no pains have been spared to get together a thoroughly representative display of every useful electrical appliance for the home. A large selection of ovens are on view under actual working conditions; ironing by electricity proceeds all day long, and the Therol water heater and Fuller geyser attract a good deal of attention. Among other items are a vacuum cleaner, also useful novelties in the form of hair dryers, vibrators, sterilisers, bed-warmers, coffee pots, kettles, &c. A portion of the premises has been arranged as a dining room, and is a source of admiration to visitors. The table is covered with an electric cloth, and is decorated with some handsome examples of candelabra and glassware.

The E.L. Committee has accepted the offer of the Windermere and District Electricity Supply Co., Ltd., for the purchase of six 75-kw., six 1½-kw., four 3-kw., and two 6-kw. second-hand transformers for £41 5s. The general manager has been authorised to sell to this company second-hand transformers to the further value of £100 during the next 12 months.

Swansea.—The Streets Committee has resolved that whenever electric cables are available for lighting, the borough surveyor and the electrical engineer are to confer with a view to the substitution of electric for gas lamps. Four electric arc lamps are to be put up in Eaton Road, Brynhfryd, at an annual cost of £12 10s. per lamp.

Walthamstow.—The L.G.B. has sanctioned the borrowing of £1,100 for feeder cables for interconnecting the Higham Hill and Blackhorse Lane feeders.

Whitchurch (Salop). — The U.D.C., which has unsuccessfully negotiated for the purchase of the gas undertaking, and for the reduction of the public lighting account (about £400 per annum), has decided to consider the question of an electrical installation.

Willesden.—The Electricity Committee reports that the chairman of the Committee, with the clerk, the electrical engineer, and Mr. J. F. C. Snell (consulting engineer), interviewed Mr. James Devonshire and Mr. T. E. Ruthven Murray, managing director and electrical engineer, respectively, to the North Metropolitan Power Co., with reference to the terms under which the Council is to receive a bulk supply from February, 1911. All matters had previously been settled, except as to metering the maximum demand. As a result of the interview, it was arranged that the "maximum demand" of the supply to the Council in each quarter shall be the maximum sum of the simultaneous readings of both the alternating and the continuous current supplied by the company to the Council occurring during such quarter, as recorded by the average readings of two appropriate indicators, one to be provided and kept in repair at the expense of the company, and the other at the expense of the Council. In regard to a letter requesting the Council to join and financially support an Association which had been formed for the purpose of giving publicity to electricity undertakings, the electrical engineer was instructed to report as to the best means to advertise the undertaking of the Council. The annual report for the year ended March 31st last, shows a gross profit of £6,594, and a net profit of £320.

Worthing.—In connection with the laying of additional feeder cables, the Electricity Committee of the T.C. proposes, with the consent of the Highways Committee, to place the fuses used for sectionising the feeding districts in pillars to be erected on the footway, instead of in chambers under the footway, as has been the practice in the past.

TRAMWAY and RAILWAY NOTES.

Accrington.—The question of the through running of the electric cars between Accrington and the Rossendale Valley, which has caused a dispute between the Rawtenstall Corporation on the one hand and the Haslingden and Accrington Corporations on the other, has been amically settled by committees of the various corporations, and it is expected that the cars will run through in a few days.

Bacup.—The Rawtenstall Town Council has adopted a resolution of the Electricity and Tramways Committee to supply any electricity which the Bacup Corporation may require for the purposes of the proposed extension of the Rochdale tramways from Shawforth to the centre of Bacup. The resolution was passed in response to a letter from the town clerk of Bacup to the town clerk of Rawtenstall, intimating that in the event of the tramways becoming an accomplished fact, the Rochdale Corporation would require a supply of current to work the service from the terminus at Bacup to Shawforth—just over 2 miles. Rawtenstall's price for the current is 1½d. per unit.

Belfast.—At a recent meeting of the Tramways and Electrical Committee, a deputation was present to urge on the Committee the desirability of having the tramways extended up the Oldpark Road for the accommodation of the residents. The manager, Mr. Nance, was directed to report on this, and also upon the proposed extensions on the Ligoneil and Donegall Roads. The question of removing the centre poles at certain points was adjourned until the next meeting.

Bradford.—At a meeting of the Finance Committee of the Corporation held on the 21st inst., it was reported that the Tramways Committee had decided to recommend that dogs should be allowed on the top deck of tramcars at ordinary fares, the conductor to be given power to discriminate between dogs suitable for passengers, and dogs likely to cause annoyance to other passengers. We understand that the subject of lady passengers being allowed to carry teddy-bears was not discussed.

Brighton.—The Tramways Committee is urging that the B. of T. should obtain powers to issue licences to local authorities for the working of rail-less trolley cars.

Bury.—A letter has been received by the Tramways Committee of the Corporation from the Association of Tramway and Vehicle Workers, in which it complains that sufficient time is not allowed in which to make the journey on a number of sections, and expressing the opinion that the speed at which cars often travel is dangerous. Consideration of the subject has been deferred for a month to enable the manager to prepare a report.

Cardiff.—Early on Sunday last 300 tramway employés met Mr. Arthur Ellis to discuss the alleged hardships attendant on the recently introduced 54 hours week. Ultimately it was agreed that the men should devise a scheme which will be submitted to Mr. Ellis for consideration.

Continental Notes.—BAVARIA.—Herr von Frauendorfer, Bavarian Minister of Railways, has just been interviewed on the subject of electric railway working and the utilisation of water-power in the kingdom. As to the question whether military reasons place certain limits upon the working of main lines by electricity, the Minister is reported to have remarked that the subject was not yet ripe for decision. The military authorities had declared themselves in agreement that electrical working should first of all be established on lines of less military importance, and the experience gained on the lines after a few years would determine the future solution of the problem. The water-power presumably intended for the purpose (the Walchensee, &c.) had already been designated by the authorities. With regard to the suggested use of Bavarian water-powers for industrial purposes, the Minister expressed a warning against an over-estimation of the value of such powers. It was not sufficient to have cheap water-power alone. It was necessary to have easy facilities for obtaining raw materials and for forwarding manufactures and also to possess good conditions of labour. Referring to the competitive schemes received in connection with the Walchensee water-power project, the Minister observed that naturally it could not be stated beforehand which plan would be carried out, although probably a combination of the features contained in the various proposals would be made. The authors of the competitive schemes included first rank firms in Germany and Switzerland on the one hand, and representatives of technical science on the other. But not a single project put the water-power of the Walchensee at 100,000 H.P. as estimated by Major Donat, the proposals ranging from 50,000 to 60,000 H.P.

GERMANY.—It is just over two years since the A.E.G. brought forward a scheme for the construction of a new underground and high-level electric railway in Berlin, and the Municipal Highways Committee has just given approval to the project in principle. The Committee has decided that in every respect the underground railway is to be preferred to the proposal for a suspended electric railway. As projected by the company, the railway would begin as an elevated line at the junction of Christiania and Schweden Strasse, and proceed to the Humboldthain, where it would descend underground by means of a decline. The railway would then continue as an underground line under the Brunner Strasse to the Waisenbrucke, pass under the Spree and subsequently rise into a high-level line and finally terminate at Hermannplatz, Rixdorf. It is estimated that the cost of construction would amount to £4,400,000.

SWEDEN.—As a result of the fresh inquiries which the electrical department of the Swedish State Railways has made with regard to the cost of electrifying the border railway (the line by which Lapland iron-ore is carried to the Port of Narvik, in Norway), a new programme has been drafted, on the basis of which two tenders have been procured. One of these is from the Swedish General Electric Co., of Västerås, associated with the firm of Siemens-Schuckert, of Berlin; the other is from the A.E.G., through the Swedish Share Emission Co. The amount of the tender is in each case kept secret. Tenders were also invited from the United Electric Co., but declined, as the latter are connected with sub-contractors of the first-named company.

ITALY.—The Società Imprese Elettrice Piacentine is to construct and work five sections of electric tramways in the town of Piacenza.

The commune of Galluzzo, in the province of Florence, has been authorised to construct an electric tramway from Tavarnuzze to Impruneta, starting from a junction with the existing Chianti line near the station of Tavarnuzze. Energy will be provided from the central station at Varlungo.

Liverpool.—The City Council at the next meeting will consider the following recommendation of the Tramways Committee: "That an application be made to the Board of Trade, under Sec. 20 of the Tramways Act, 1870, for their sanction to the borrowing of the sum of £10,000 for the provision of additional cars, and that the amount which may be sanctioned by the Board be placed at the disposal of the Tramways and Electric Power and Lighting Committee."

Newcastle-on-Tyne.—A report has just been issued by the general manager of the Corporation tramways on the present condition of the undertaking. In the course of it he reviews the history of the concern, and then goes on to refer to the late engineers' strike, and the severe depression which followed. Many concessions, he says, were granted just prior to the strike, and it was, therefore, impossible to make a fair comparison with the year's working prior to the concessions being granted. This was decidedly unfortunate, as, if a fair comparison could have been made, it would have been of very considerable value in deciding how far the concessions had affected the undertaking. Every endeavour was being made to curtail the expense of car maintenance, consistent with the safety of the travelling public, and the well-being of the cars themselves. The system had always been heavily handicapped owing to the variety of cars. There were far too many cars of the eight-wheeled type, and not enough of the four-wheeled top-covered type. The Tramways Committee might take it as an accepted fact that the life of the large cars was very limited, owing to their bad design, and, therefore, it would become necessary sooner or later to replace those cars. He recommended that a start should be made as soon as convenient with building a better kind of car to replace them. Seeing that it was the desire of the Committee to reduce their operative expenses, Mr. Hatton points out that the maintenance of the permanent way must be placed under his control. When he was appointed by the City Council the appointment stated that he was to undertake the complete control and management of the system. He had not that control when another department had control over an expenditure of some £8,000 per annum. In the course of a reference to ½d. fares, he says one could not ignore that class of person who was always clamouring for ½d. fares. There was a section of the public who would be perfectly satisfied if they could have the same fares and stages as in Glasgow—half-mile stages for ½d., and four ½-mile stages for 1d.—but there no difference was made between workmen's fares and ordinary fares. The above conditions in Newcastle would, undoubtedly, benefit the 1d. passenger, but a workman who now travelled on the Newcastle system 1½ miles for a ½d. coupon ticket, would then be reduced to half a mile for a ½d., and the workman who could now travel close upon four miles for a 1d., would only be able to travel two miles for a 1d. under the Glasgow system. It was probable that such an alteration would raise more opponents than it found supporters. No doubt the reply would then be, "let us retain our present system of workmen's fares and stages, and give us in addition a system of fares and stages as are in use in Glasgow." The undertaking would then have to be supported out of the rates in a similar manner to the other great departments of the Corporation, *i.e.*, there would have to be a rate levied to produce the necessary funds to carry on the tramway system. Mr. Hatton maintains that the tramway system is in great need of an average fare greater than a 1d. It was essential that some alteration should be made in the workmen's fares. For cheapness the workmen's ½d. fare in Newcastle had no equal in the provinces. Further, there must be an alteration in the present coupon system. He makes certain recommendations, including the following:—

Every car throughout the day shall run at a penny minimum fare except for school children. This is the same condition as at present.

On every car run before 7 a.m. the conductor shall issue a return ticket value 1½d. to cover the return journey over any 1d. section. This is an increase upon the present ½d. workman's fare.

That the conductors shall be empowered to issue (or withhold) these return tickets only to men dressed as artisans, or who, to all appearances, are of that class.

Failing the adoption of those modifications, Mr. Hatton suggests that the Committee should adopt a system which is in use in some towns:—That up to 7 o'clock in the morning a universal penny workmen's fare shall be charged, and to those who desire the same a return ticket for 2d. shall be issued allowing for the return journey at any time of the day. That system had many advantages compared to any other, and it treated all workpeople alike. The last-named system appealed to him as the best suited for the city and the least expensive to work. Dealing with ordinary fares the manager states that what the system required was an average fare of something greater than a penny. He suggests a revision of stages with alteration of fares, but the whole route would remain the same in each case as at present, that was 1½d., but to encourage the long-distance traveller he proposed that anywhere in the 1½d. section a return ticket covering the whole route should be issued for the fare of 2½d. It was undesirable to revert to the old fares and fare stages. In conclusion, Mr. Hatton says:—"The course that I should adopt if the undertaking belonged to me is to reduce the working expenses to a minimum by further cutting down the expenditure, and await developments. With improved times, and then—and then only—if matters do not improve to the satisfaction of the Committee, the Committee and the whole of the ratepayers in the city will know that there is only one alternative—*i.e.*, to increase the fares, but not necessarily by falling back on the old fares and fare stages and conditions, as even that altered condition of affairs may not yield that amount of money that it is necessary to set aside annually for renewals and depreciation."

At midnight on Saturday last the Newcastle and District Tramway Workers' Union held a largely attended meeting to discuss the action of the tramways department in connection with the reorganisation of working which is being carried out. Ultimately resolutions were carried protesting against the methods of the management in evading consideration of grievances, and in regard to the Tramways Committee's action respecting the car cleaners.

Rawtenstall.—The T.C. on Thursday passed a resolution agreeing to the through running of cars between Bacup and Accrington upon certain conditions for 12 months. A subcommittee has been appointed to deal with additional stopping places between Lockgate and Bacup.

Rotherham.—The T.C. has decided to apply in a Parliamentary Bill for power to run rail-less cars in the Wickersley, Bramley, Maltby, Tickhill, Whiston, Aston, Swallownest, Aughton, Brinsworth, Tinsley, Catcliffe, Treeton, Laughton, Brampton, Dinnington and Thorpe Hesley districts.

West Ham.—In conjunction with East Ham and Leyton, arrangements have been made with the L.C.C. for tramway through-running between Aldgate and Ilford Broadway, and Aldgate and the Green Man, Leytonstone. The basis arrived at was an equal earning value for the whole of the lines, the route between Stratford and Aldgate being provided with a doubled service, as compared with the other lines, as at present.

TELEGRAPH and TELEPHONE NOTES.

Cable Cut.—It is reported that the cable of the Ministry of Marine along the Finnish coasts has been cut between Lachta and Mugenport, and 300 metres of it have been carried away.

Cable Repaired.—Cheiksaid-Perim, October 10th, 1909.

Ceremony by Cable.—The daily Press during last week contained much matter in reference to the opening of (or giving the signal to open) the doors of the new Tuberculosis Institute, from West Dean Park, Chichester, to Belmont Park, Montreal, by the King. The lines were cleared in the usual manner, and the point connected with the ceremony which calls for special notice is the vast improvement in automatic relays brought about during the last few years. Nearly forty years ago one of our contributors took part at the other end when His Majesty (then the Prince of Wales) was present at the residence of Mr. Pender, at 18, Arlington Street, at an inaugural fête to celebrate the opening of direct submarine telegraphic communication with India. It was even so early in the history of the invention of using a wire to direct and control electric impulses, that through submarine cables for vast distances and with numerous manual transmissions—far greater than the transmission across the Atlantic—messages were passed along a clear course from His Royal Highness to H.E. the Viceroy of India, containing 57 words, and a reply was written and received in London in 11 minutes. Sir Bartle Frere also dispatched a message to the Governor of Bombay, containing 19 words, and the acknowledgment was received in London in 4 minutes 50 seconds. The interest of the world was at that period centred in the question how quickly it was possible to get a message from the United Kingdom to India and back, and this was actually accomplished in 4 minutes 22 seconds, and from Malta to Bombay and back in 1¼ minutes, over six independent circuits, one after the other, by hand, or there and back, 12 transmissions.

Emden-Teneriffe Cable.—The *Elektrotechnische Zeitschrift* of October 7th contains interesting particulars of the German cable to South America. On August 26th last the Emden-Teneriffe section was opened to international traffic. Our contemporary states that this cable is owned by the Deutsche-Sudamerikanische Telegraphengesellschaft, of Cologne, who laid it at the request of the Imperial Postal Department, and is to form part of a system of cables connecting the German West African Colonies and South America with the German Empire. The *Zeitschrift* emphasises the fact that the German system at present ends at Vigo. It is not yet known if the Teneriffe-Pernambuco section is to be laid direct or *via* Monrovia, but it is considered that the extra cost of this deviation will be more than counterbalanced by the connecting up of the West African Colonies over German cables. The section already laid was manufactured by the North German Cable Works at Nordenham, and the cable steamer *Stephan*, from June 15th to 26th, laid 676 N.M. of cable to the mouth of the Canal, and between July 25th and September 2nd, the remainder of the cable to Teneriffe —1,431 N.M. The short cable between Borkum and Emden worked in conjunction with the system is owned by the German Government, and was already laid last year.

The cable has one conductor:—

Shore End and Intermediate core, 600 lb. copper/340 G.P.

Deep Sea type core, 500 lb. copper/315 G.P.

The conductor of the Shore End and Intermediate is a single wire of 3 mm. surrounded by 12 wires of 1 mm. diameter. The conductor of the Deep Sea is also a single wire of 2·73 mm., surrounded by 12 wires, 0·91 mm. in diameter, C.R. 2,017ω, or about 2·42ω per N.M. at 75° F.; capacity 445 mfd., or ·4200 mfd. per N.M.

The core was subjected to a pressure of 600 atmospheres.

The dielectric resistance is not less than 400 megohms per N.M. The outer covering of the cable varies according to type. The core of the shore end and intermediate types is brass taped.

The telegraph authorities at Emden work the German end of the cable, while the station at Teneriffe is in the building of the Spanish Government telegraphs at Santa Cruz, but the cable is worked by the company's employés.

The land cable between Borkum and Emden has two conductors of the same size as the intermediate cable, one being used as an earth connection.

The capital of the company is at present 11,800,000 Mark, of which 4,000,000 Mark is in shares, and 7,800,000 Mark in 4½ per cent. debentures.

Long-Distance Telephony.—According to the Italian newspapers, the work of establishing a telephone connection between Italy and Germany will be completed within a brief period. The line proceeds from Milan and follows the St. Gothard railway, terminating at Frankfort-on-Main. The charges for utilising the telephone between the two cities have already been fixed by the two States interested. It is said that Switzerland, which has not participated in the connection, will receive compensation from both Germany and Italy.

Newfoundland Cable.—The *Telegraph Age* states that the authorities have stopped the laying of the Commercial Cable Co.'s underground conductors through the streets of St. John's to the company's city office, so that the operating staff has had to be housed in the cable hut, on a most desolate seashore. The contract with the Government having been repudiated, the company is liable to pay an annual tax of $8,000, besides a rent of $2,000 a year demanded by the city of St. John's for the right to carry the telegraph line into the city. For the last two months the company has been doing a through-traffic business between London and New York, having no connection with Newfoundland business.

Rose's Universal Code Economiser.—Invented by Sydney A. M. Rose, A.M.I.E.E. London: Sidgwick and Jackson, Ltd. Price 10s. 6d.—This system, in the words of the author, is the outcome of much thought, and was devised to overcome vexatious errors, entailing much delay, from which he has greatly suffered; the economiser is intended to provide for the use of any number from 0 to 159,999 as a pronounceable code word of seven letters, each word being quite distinct from any other of the remainder of the 160,000 words in Section "C." In addition to the foregoing, any sum of money ranging in halfpenny stages up to £6,666 13s. 3½d., or its equivalent in dollars and cents, can be transmitted in one word in Section "F," or any sum from one halfpenny or cent up to £3,199,999 19s. 11½d., or $15,359,999.99 c. in Section "G." A key table is given in which numbers from 1 to 19 are represented by consonants B, C, D, F, G, H, J, K, L, M, N, P, R, S, T, V, W, X, Y, Z, and the vowel "U" is inserted between each two letters representing numbers, to separate one from the other. A fixed divisor of 20 is agreed upon to reduce a series of figures to numbers within the scope of the key table, and letters thus selected are formed into code words with the vowel "U" inserted as above stated. This vowel is looked upon as a check upon any irregularity or mutilation of a word by the telegraph system, but we do not follow Mr. Rose in this claim, as bad spacing, the only class of fault which he contemplates, is not the only reason for errors; if a dot or dash be dropped, the check of the "U" will not serve at all. Much complaint has been made by telegraph companies and administrations of the nature of words used by the public, and we hardly think combinations such as BUBUBUBUBUB, ZUKUVUVUX, LUSUGUFUPUC will serve the cause of accuracy; in the rush and scurry of getting the message off, an operator might be confused. Mr. Rose may have a partial check, but it would seem by the above three words that 14 of the letters are wasted to secure this advantage, and the system of the divisor 20 is to this extent neutralised. Two of the words quoted contain more than 10 letters each, and would be chargeable as two. The dividing or multiplying by 20 as many as five times, also seems a cumbrous task, and errors in calculations may be made. Delays or serious consequences caused by errors in telegrams in proportion to the large number handled are very small, and if greater attention were paid to the formation of code words, it may be reasonably advanced that greater accuracy would follow.

Rowland Telegraph System.—Explaining the reason for its abandonment of the Rowland printing telegraph system, the Postal Telegraph Cable Co, New York, states in the *Telegraph Age* that excellent results have been obtained with the system, which has been in use for about two years on six of the company's circuits, three being operated octoplex, two quadruplex and one duplex. The octoplex circuits had each a carrying capacity of 2,000 to 2,500 telegrams of 30 words each per day, and the other circuits in proportion, while on emergency this traffic could be increased by 50 per cent. But it was not found possible to maintain the apparatus in working order, it being subject to more or less frequent interruption, and it could not be used upon wires with which the attendants were not familiar. The company having determined to prevent every avoidable delay to telegrams, found it necessary to stop using the printer, the use of which was always regarded as experimental. Improvements may be effected in the apparatus, and it is quite possible that further experiments will then be made.

Wireless Telegraphy.—Experiments with the portable outfits made by the Telefunken Co., for the German Army, have shown that with them communication can be maintained between Berlin and Vienna, a distance of 1,550 km., or 963 miles.

An Admiralty station is to be erected at Wick.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—VICTORIA.—Electric lamps for the P.M.G. See "Official Notices" October 15th.

MELBOURNE.—February 22nd, 1910. The Postmaster-General is calling for tenders for the erection of wireless telegraph stations on North and South Heads, Sydney, and on Fremantle Heights, Western Australia, capable of communicating with ships up to 1,000 miles.

MELBOURNE.—Telegraph and telephone material, for the P.M.G. See "Official Notices" to-day.

Belgium.—December 31st. The municipal authorities of Jupille are inviting tenders for the concession for the lighting of the little town by gas or electricity.

Bradford.—November 13th. General stores for the Tramways Department for a year (returnable deposit of £1 1s.). Tramway Offices, 7, Hall Ings, Bradford.

Canada.—Montreal.—Tenders are being called by the Saraguay Electric and Water Co. for turbo-generators of 2,000 kw. capacity. Proportionate increase of power-house boilers and other equipment will be made likewise. Charles Brandeis, consulting engineer, 4, Phillips Place.

Ottawa.—November 25th. Tenders are invited for the packing of material and supplies for points along the Yukon telegraph line between Quesnelle and Atlin, in the course of the season of 1910, 1911 and 1912. Forms of tender and specification may be obtained and form of contract seen on application to Mr. J. T. Phelan, Superintendent of Government Telegraphs, Vancouver, B.C.; Mr. William Henderson, District Superintendent Government Telegraphs, Victoria, B.C.; and from the Government Telegraph Agents at Ashcroft, B.C.; Quesnelle, B.C.; Hazelton, B.C.; and Telegraph Creek, B.C. Napoleon Tessier, Secretary, Department of Public Works, Ottawa.—*Canadian Engineer.*

Eastbourne.—Tenders are to be invited for a condensing plant, similar to the one now in use at the generating station. The estimated cost is £1,835.

Epsom.—November 2nd. Eight D.C. long-burning flame arc lamps for the U.D.C. See "Official Notices" October 22nd.

India.—Lucknow.—December 31st. The Lucknow Municipal Board is prepared to consider proposals for the grant of a concession for the supply of electrical energy, coal or oil gas, within the municipal limits of Lucknow, for house and street lighting and other domestic or manufacturing purposes. Particulars of area of supply, &c., can be obtained on application to the Secretary of the Board. Tenders will be received up to December 31st, 1909. R. Hobart, I.C.S., Chairman Municipal Board, Lucknow, India.

Italy.—November 3rd. The Italian State Railway authorities in Rome are inviting tenders for the supply of four electric motors for the railway workshops in Rome.

London.—L.C.C.—November 1st. Brass and other castings and fittings, lamp glasses, carbons, insulating materials, cables and lamps, for the L.C.C. See "Official Notices" October 22nd.

London.—November 3rd. Electric lighting installation at the Buxton Street Elementary School, Whitechapel. See "Official Notices" October 22nd.

Sherburn (Co. Durham).—November 6th. Electric light installation for the main portion of the parish, for the P.C. A. Stanley, clerk, Leamside, Fence Houses.

Turkey.—November 30th. The municipal authorities of Broussa are inviting tenders for the concession for the establishment of a central electric lighting station and a system of electric tramways in the town.

Warrington.—November 2nd. Arc lamp lowering gear for the Corporation Electricity Department. See "Official Notices" October 22nd.

CLOSED.

Aberdeen.—The Public Health Committee has accepted the tender of Messrs. J. Blaikie & Sons, at £610, for the electric light installation at the City Hospital.

Brumby and Frodingham.—The U.D.C. has accepted the tender of Messrs. Reid, Ferens & Co., of Newcastle-on-Tyne, for electric light standards, &c., for the streets, at £278.

Canada.—Quebec.—According to the *Canadian Engineer*, the Verdun Municipality has awarded the following contracts:—

Two engines for electric installation.—Belliss & Morcom, Birmingham, England; agents, Messrs. Laurie & Lamb, Montreal; $9,500.

Two 235-K.V.A., three-phase, engine-type generators, with direct-connected exciters and complete switchboards.—The Canadian Westinghouse Co., $7,592.

Mr. Charles Brandeis, of Montreal, was consulting engineer.

Dundee.—Messrs. A. Westwood & Son have secured the contract for the electric lighting of the Corporation branch reading room, at £110.

Fleetwood.—The tender of the Klein Engineering Co. for the erection of a cooling tower at the electricity works has been accepted by the D.C., at £280.

Glasgow.—A Committee of the T.C. has recommended for acceptance the offer of Fairlie & Paxton for collector brushes.

Haslingden.—The Chloride Electrical Storage Co., Ltd., have secured the contract for a 500-volt battery, a Highfield booster and switchboard for the tramways.

Hertfordshire.—The County Council has accepted the tender of Rogers & Gowlett, Ltd., at £138, for substituting metallic-filament lamps for carbon lamps in five schools, requiring approximately 800 lamps.

India.—The Globe Electric Co., Ltd., have secured the contract for a large number of their latest pattern, 1909, long-burning "Globe-Santoni Standard" flame lamp, for the Bengal-Nagpur Railway. The contract includes the whole of the insulators, brackets and wiring sundries for the installation.

La Plata.—The Chloride Electrical Storage Co., Ltd., are supplying an Entz booster and switchboard in connection with the lighting and tramway circuits.

London.—L.C.C.—During the summer recess the Highways Committee received tenders for supplying and laying 440,000 stoneware ducts in connection with the electrification of further portions of the tramways. The following is a list:—

(1) Supply of Stoneware Ducts.

	Rate for 1,000 ducts.	Quantity.	Amount of tender (including £100 for extra works).
Stanley Bros., Ltd. (accepted)	£9 0 0	440,000	£4,060 (less 2½ % cash)
Sutton & Co.	9 17 3	222,000	2,270
H. R. Mansfield	10 4 11	100,000	1,125 (less 2½ %)
Hosea Tugby & Co., Ltd. ..	10 4 11	250,000	2,661 "
Ensor & Co., Ltd.	10 5 0	440,000	4,610 "
Robinson & Dowler	11 0 0	100,000	1,200 "
Doulton & Co., Ltd.	12 0 0	100,000	1,300 "
R. W. Blackwell & Co., Ltd.	13 13 6	440,000	6,117
Joseph Place & Sons, Ltd. (not to specification) ..	15 0 0	100,000	1,600

Estimate of chief officer of tramways, £4,800.

(2) Laying of Stoneware Ducts.

Reid Bros.	(accepted)	£26,622
Westminster Construction Co., Ltd.		26,886
Bower Bros.		31,307
Dick, Kerr & Co., Ltd.		31,497
John Mowlem & Co., Ltd.		32,501
Callender's Cable and Construction Co., Ltd.		33,209
Robert W. Blackwell & Co., Ltd.		34,055
R. C. Brebner & Co.		50,548

Estimate of chief officer of tramways, £29,750. Messrs. Reid Bros. will sublet certain portions of the work.

During the recess tenders were also received for high and low-tension switchgear and motor-generators, required for further tramways electrification:—

(1) High and Low-tension Switchgear.

Switchgear Co., Ltd.	(accepted)	£3,517
Johnson & Phillips, Ltd.		3,625
Spagnoletti, Ltd.		3,670
Ferranti, Ltd.		4,112
Electric Construction Co., Ltd.		4,176
General Electric Co., Ltd.		4,226
British Westinghouse Electric and Mfg. Co., Ltd. ..		4,864

Estimate of chief officer of tramways, £3,550.

(2) Motor-Generators.

*Lancashire Dynamo and Motor Co., Ltd.		£3,467
General Electric Co., Ltd.		3,821
*Bruce Peebles & Co., Ltd.		3,939
Dick, Kerr & Co., Ltd.	(accepted)	4,203
British Electric Plant Co., Ltd.		4,231
British Westinghouse Electric and Mfg. Co., Ltd. ..		4,291
Brush Electrical Engineering Co., Ltd.		4,997
Electric Construction Co., Ltd.		5,428

Estimate of chief officer, £4,750.

* Not to specification.

Messrs. Dick, Kerr's tender was accepted because the Council already has a large number of their machines of the kind working very satisfactorily.

Southwark.—The B.C. has received the following tenders for the motor-generating plant for Kennington Theatre:—

British Electric Plant Co.—(*a*) Two 40-kw. motor-converters, £250; (*b*) switchboard, £68; (*c*) two 3-kw. motor-converters, £96; (*d*) switchboard, £32.

General Electric Co. (accepted for *a* and *b*).—(*a*) £398 10s., (*b*) £37 5s., (*c*) £88 10s., (*d*) £26 10s.

Electric Construction Co.—(*a*) £386, (*b*) £67 10s., (*c*) £85, (*d*) £24.

Pooley & Austin.—(*a*) £376, (*b*) £57 10s., (*c*) £94, (*d*) £19 10s.

Siemens Bros. Dynamo Works.—(*a*) £394, (*b*) £88, (*c*) £86, (*d*) £47.

Crompton & Co. (accepted for *c* and *d*).—(*a*) £389 (alternative, £363, less 10 per cent.), (*b*) £53, (*c*) £88, (*d*) £3 6s.

Westinghouse Co.—(*a*) £400, (*b*) £102, (*c*) £87, (*d*) £102 (switchgear included).

Lancashire Dynamo Co.—(*a*) £414, (*b*) £100, (*c*) £106, (*d*) £17.

Mather & Platt.—(*a*) £422, (*b*) £91 10s., (*c*) £100, (*d*) £35 12s.

Electrical Co.—(*a*) £440 (switchboard included), (*c*) £83 (switchboard included).

Sweden.—The Korsnäs Share Co. has recently, through a firm in Gothenburg, ordered two steam turbines for the new pulp mill at Karskär from the English firm of Willans and Robinson, and also two electrical generators of 1,500 kw. The latter will be made by the Swedish General Electric Co., whose tender was lower than those of the British electrical manufacturers. The whole contract amounted to about 200,000 kr. (£11,111). The turbines are specially arranged so that part of the steam can be used for heating and drying at a pressure of 1½ atmospheres. Similar turbines were supplied by Messrs. Calvert & Co., of Gothenburg, to a factory at Ortviken.

Walthamstow.—The U.D.C. has accepted the tender of Henley's Telegraph Works, Ltd., at £690, for feeder cables.

War Office.—Messrs. J. G. Childs & Co., Ltd., of Willesden Green, N.W., have just obtained an order from the War Office for three lifts for the Royal Army Clothing Factory at Pimlico. They have also received another order from the London, Brighton and South Coast Railway for a crane for Brighton, making the third supplied this year.

Watford.—The U.D.C. has accepted the tender of the British Westinghouse Co. for the annual supply of transformers.

Woolwich.—The B.C. has accepted two tenders as follows for carbons for the next 12 months:—

Oliver Arc Lamp for B and E.
Siemens Bros. for C and D.

With regard to "A," the Council decided, in view of the variation in the amounts of the different tenders, which seemed to indicate a great difference in the quality of the carbons offered, to have tests made of the various samples.

Worthing.—The T.C. has accepted the tender of the Callender Cable and Construction Co., Ltd., for 4,110 yards of vulcanised bitumen-sheathed concentric and triple-concentric cables, at £1,038. The other tenders received were:—

Johnson & Phillips, Ltd.	£1,097
W. T. Glover & Co., Ltd.	1,099
British Insulated and Helsby Cables, Ltd.	1,099
Henley's Telegraph Works Co., Ltd.	1,100
Western Electric Co.	1,102
Siemens Bros. & Co., Ltd.	1,107
St. Helens Cable Co., Ltd.	1,130
Frankenburg & Sons, Ltd.	1,196
Aubert Grenier & Co.	1,428

FORTHCOMING EVENTS.

Institution of Mechanical Engineers.—Friday, October 29th. At 8 p.m. Extra meeting. Resumption of discussion on Prof. W. E. Dalby's paper on "Heat Transmission."

North-East Coast Institute of Engineers and Shipbuilders.—Friday, October 29th. At 7.30 p.m. At the Lit. and Phil. Society, Newcastle-on-Tyne. Annual meeting. Paper on "Notes on Marine Boiler Design, Construction and Economy," by Mr. D. Myles.

Northampton Institute Engineering Society.—Friday, October 29th. At 5.45 p.m. Paper on "The Development of the Marine Steam Engine," by Mr. A. T. Barber.

P. & O. Batti-wallahs' Society.—Monday, November 1st. At 8 p.m. At the Holborn Restaurant, Council Chamber. Smoking concert.

Institution of Electrical Engineers (Manchester Section).—Tuesday, November 2nd. At 7.30 p.m. At the University, Manchester. Paper on "The Electric Ignition of Internal Combustion Engines," by Mr. J. W. Warr.

Institution of Civil Engineers.—Tuesday, November 2nd. At 8 p.m. Presidential address by Mr. J. C. Inglis, presentation of medals and prizes, and reception by the President.
Tuesday, November 9th. At 8 p.m. Papers on "The Single-phase Electrification of the Heysham, Morecambe and Lancaster Branch of the Midland Railway," by Messrs. J. Dalziel and J. Sayers; and "The Equipment and Working Results of the Mersey Railway under Steam and Electric Traction," by Mr. J. Shaw.

Institution of Electrical Engineers (Birmingham Local Section).—Wednesday, November 3rd. At 7.30 p.m. At the University, Birmingham. Inaugural address by Mr. R. K. Morcom.

Civil and Mechanical Engineers' Society.—Thursday, November 4th. At 8 p.m. At Caxton Hall, Westminster, S.W. Paper on "Technical Popular Fallacies," by Mr. A. S. E. Ackermann.

Roentgen Society.—Thursday, November 4th. At 8 p.m. At 20, Hanover Square, W. Presidential address by Mr. C. E. S. Phillips.

Institution of Electrical Engineers (Manchester Students' Section).—Tuesday, November 9th. At 7.30 p.m. At the Mosley Hotel, Manchester. Supper and smoking concert.

Institution of Electrical Engineers (London).—Thursday, November 11th. At 8 p.m. Opening meeting. At the Institution of Civil Engineers. Presidential address by Dr. Gisbert Kapp.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

The following orders are issued for next week:—

Commanding Officer—Col. R. E. B. Crompton, C.B.

Monday, November 1st.—"A" Company. Technical drill, 7 to 9.30 p.m.

Tuesday, November 2nd.—"B" Company. Technical drill, 7 to 9.30 p.m.

Wednesday, November 3rd.—Gymnasium, 6.30 to 9.30 p.m.

Thursday, November 4th.—"C" Company. Technical drill, 7 to 9.30 p.m.

Friday, November 5th.—"D" Company. Technical drill, 7 to 9.30 p.m.

(Signed) P. H. Campbell, Capt. R.E. and Adjutant,
For O.C. E.E., L.D.

National Electrical Manufacturers' Association.—The next committee meeting of this Association will be held on Tuesday, November 9th, at Balfour House, Finsbury Pavement, E.C., at 2.30 p.m.

NOTES.

Inquiries.—A correspondent wishes to know where he can obtain information on the subject of "The Thermal Conductivity of Heat Insulators," in the form of papers or books. Probably the "Engineering Index" and "Science Abstracts" would help him. Another wants the name of maker of the "King" magnetic separator.

Magneto Ignition.—We were recently asked by a well-known engineer, "Who invented magneto ignition as applied to gas engines?" Can any of our readers tell us to whom belongs the credit of this invaluable invention?

Parliamentary.—Electric Light Employes.—In last Friday's Parliamentary papers, Mr. Steadman asked the Postmaster-General whether, in view of the fact that a scale of wages to govern the electric light employés of his department had been submitted by the Executive of the Association to which the men belong, he was in a position to signify his acceptance of the rates, and if not, would he state the grounds of his objection. Mr. Sydney Buxton replied that the Select Committee of the Post Office Servants recommended that as regarded the electric light staff, the Post Office should pay the wages and observe the conditions of labour which were, from time to time, agreed upon in the various districts by the organised masters and men. He further stated that inquiries were proceeding on the subject, and he hoped the matter would soon be settled.

The Engineering Department of the Post Office.—Mr. Tyson Wilson, in Friday's Parliamentary papers, asked the Postmaster-General whether a number of construction hands in the engineering department had recently been dismissed, and whether he would state the reason of their discharge; and further, whether the men would be provided with work during the winter months. Mr. Sydney Buxton, in reply, said that it had become necessary during the last 18 months to take on extra hands for the strengthening and partial reconstruction of some of the main telephone trunk routes in the North of England, which could not be delayed. The work had now come to an end, and the general quantity of Post Office work had reverted to its normal level. The men paid off would be taken on again as soon as circumstances permitted.

Electric Lighting Acts Amendment Bill.—In the House of Lords on Tuesday, after some discussion on the amendments made by the House of Commons, an amendment was moved by Lord Belper, who desired to permit electric supply companies to supply current for energy to railway companies for purposes connected with their undertakings. According to the *Daily Telegraph*, Lord Hamilton of Dalzell opposed the amendment on behalf of the Government, but did not divide the House. The amendment was agreed to, and the other amendments made by the Commons were accepted without further discussion.

Electricity in Mines.—On Monday a visit was paid to the works of the Electric Construction Corporation, Ltd., Wolverhampton, by the South Staffordshire, Warwickshire, and Worcestershire branch of the National Association of Colliery Managers; the visitors, numbering over 20 members (headed by Mr. Arthur Hall, president), were courteously conducted over the works by Mr. W. Bulloch, the manager, who explained the technicalities of the various processes in the manufacture of electrical equipment. Subsequently a vote of thanks was accorded the company, in replying to which Mr. Bulloch pointed out that, while electricity was extending in underground operations, there was great scope for its further use.

Electrolytic Disinfectant.—The report of the Public Health Committee of the Poplar Borough Council on the working of the electrolytic plant during the past summer shows that the demand for the fluid could not be fully met, although the plant was worked overtime. The stability of the fluid during the hot weather was found to be very good. The total output for the year to the end of August was 17,794 gallons; during August the output was 4,326 gallons. The total cost of materials was £37 19s., including electrical energy (2,988 units at 1½d.), £18 13s. 6d.; the cost per gallon, therefore, was slightly over ½d. During the past four years nearly 80,000 gallons of the fluid have been made, at a cost, for electricity and materials, of under £160, and a great saving has been effected in outlay that would otherwise have been necessitated. The plant is in good order, and extensions are under consideration, with a view to meeting the increased demand, the estimated cost being £430. By far the largest item of cost is that of wages, mainly incurred in bottling and issuing the fluid, and amounting to £416 for five men, apparently from January to August, 1909, inclusive. This, on the basis of 18,000 gallons, means over 5d. a gallon issued, and including sundry expenses, the total cost appears to be about 6d. a gallon. The Works Department is supplied, however, at 1d. a gallon. The mode in which the accounts are presented renders it difficult to arrive at a definite decision as to the unit cost, for on the first page we find the cost of materials, bottles, &c., from February, 1906, to January, 1908, inclusive, and from January, 1908, to December, 1908, inclusive; on the second page, the cost of the same items from January, 1909, to August, 1909, inclusive, a detached statement as to the total quantity manufactured during four years, an account of wages over a period unstated, and a statement of total cost of the fluid, bottles, &c., from 1906 to 1909; on the third page, a statement of capital and maintenance costs of the plant, cost of carbolic disinfectants for the years 1903, 1904 and 1905, and wages spent on bottling and issuing carbolic acid during those years. The whole forms a remarkable jumble, such as we have rarely met with in connection with a public department.

Two interesting reports have been issued by Dr. Alexander on the use of the fluid for disinfecting and deodorising the water in public swimming baths. It seems clear from the tests and analyses made, as well as from observation of the appearance and odour of the water, that an immense improvement is effected in the state of the water by treatment with a comparatively small quantity of electrolytic disinfectant—some 40 gallons to a bath of 75,000 gallons on the first day, and 20 gallons a day afterwards, the same water being used for three or four days. It was found that the water remained unpolluted for several days when thus treated, and the bathers expressed their appreciation of the improvement.

Impregnation of Field Coils.—In a report of the Committee on Equipment to the Convention of the American Street and Interurban Railway Engineering Association, the impregnation of both new and old field coils was highly recommended. In carrying out the impregnation process with wire-wound field coils the wire is insulated with asbestos, which is held on by a thin cotton covering. The coil is wound in a form of definite dimensions. After winding, the coil is taken out of the form and wrapped with porous tape. The coil is then filled with asphaltum compound by the vacuum process. This process consists of putting the coils in an air-tight pot or kettle, the same being heated; while the coil is hot the air is exhausted from the kettle, thus taking the air out of the coil. When a good vacuum is obtained, hot melted asphaltum is allowed to flow in from another kettle, and as soon as the coils are covered with asphaltum, it is turned off and air pressure is applied on top of the asphalt in the compounding kettle, and thus the asphalt is forced into all the spaces in the coil. When cooled down slightly, the coils are taken out and allowed to become fairly cool. Then clamping plates are placed on the coil, both back and front, to bring the compounded coil to the exact dimensions desired. After the coil is cold the clamps are removed, the first taping is removed and varnished cambric insulation is put on the coil. This treatment makes a compact coil of definite dimensions which, when bolted up in the motor, will maintain its dimensions and is not liable to become loose.—*Electrical World.*

A Moral Tale.—We have received the following story, founded on facts in connection with a London contract recently awarded:—

THE KIND BURGLAR. (A Story and a Moral.)

By A. H. P.

Scene: Inside a villa. "*The Pad-Tec-Stute.*"

Time: A week ago.

Characters: Bill Sykes (*alias* Bill Westingcastle), standing 7 ft. high, and broad at that.

Mr. Willie Contractor (rightful owner of above villa), short of stature and weak of muscle.

Mr. W. C. wakes up (after having peacefully dreamed that he had a tender accepted), to find that B. S. has ransacked the place. The latter is standing near by, calmly smoking.

Mr. W. C. (very, very timidly): "What are you doing here, *please?*"

B. S.: "What am I adoin', eh? Why! ain't I a Socialist, and believes in sharing everything with me pals? (Wiv a bit over on my side.) What are yer agrumblin' at, Cocky? Shut up, an' let me do the job in peace, I ses." (Threatens Mr. W. C. with a bludgeon.)

Mr. W. C.: "But . . . please, it's really mine . . . I . . ."

B. S.: "Less of it—but look 'ere, I've took a fancy to yer, like, so 'ere yer are—'ere's yer chance, me boy. Just come here." (Proceeds to pull Mr. W. C. out of bed, and takes him downstairs, where Mr. W. C. observes that his silver is on a wheelbarrow ready to be moved.) "Now, you wheel that 'ere barrow to my 'ouse, and *I'll give yer a bob*—'an come on quick before the 'Cop' comes round."

(Mr. W. C. looks at Bill's 7 ft., and then at the bludgeon, and proceeds to *earn* the bob.)

Moral: Half a job is better than none at all.

An Inventors' Exhibition.—An exhibition of inventions will be opened next year by the Royal Central Board of Trade at Stuttgart. The chief object of the exhibition is to call the attention of manufacturers and capitalists to inventions which ought to be economically exploited. The exhibition will include only inventions which are patented in Germany, or for which applications for patent have been made. The most noteworthy feature of this exhibition is that it is the Government itself, represented by the Board of Trade, which has taken the initiative. In the first instance, a great number of patent agents from all parts of Germany were asked to express their views on the matter, and by them the suggestion was warmly approved of. Of special interest are the views of the Government with regard to this matter, which were expressed by the President of the Board of Trade in a speech which formed the introduction to a discussion of the proposal. The President first drew attention to that branch of the Board which dealt with the protection of industrial rights. It was a common experience, he said, that people of small means, who wished to protect their ideas or inventions, were frequently quite helpless and fell into the hands of unscrupulous patent agents or others. This circumstance had led the Government to open an office, which gave advice free of cost to all interested in industry. During so short a period as nine months, the office had already given professional advice to 500 persons. The President then proceeded to explain the objects of the exhibition, which were to bring inventors and manufacturers into touch with one another, to enable the former to show their inventions to the greatest possible number of interested persons, and to give the latter the opportunity of making themselves acquainted with the existing inventions and improvements. The idea seems to be a good one, and might be given a trial in other countries also.

Institution and Lecture Notes.—INSTITUTION OF ELECTRICAL ENGINEERS (MANCHESTER LOCAL SECTION).—We have received the syllabus of meetings for the new Session, showing that the following papers will be read:—

November 2nd.—J. W. Warr, A.M.I.E.E.: "The Electric Ignition of Internal Combustion Engines."

November 16th.—L. E. Wilson: "Telephones."

November 30th.—Prof. E. W. Marchant, M.I.E.E., and E. A. Watson: "Recent Developments in High-Tension Transmission on Overhead Lines."

December 14th.—L. J. Lepine, Student, and A. R. Stelling, Dipl.Ing., Student: "Notes on Methods and Practice in the German Electrical Industry."

January 11th, 1910.—Prof. A. Schwartz, M.I.E.E.: "The Testing of Rubber for Electrical Work."

January 25th.—W. P. Durtnall, M.I.Mar.E.: "The Generation and Electrical Transmission of Power for Marine Propulsion."

February 8th.—A. G. Cooper, A.M.I.E.E.: "Three-Wire Balancers."

February 22nd.—B. Thomas, A.I.E.E., and E. Thomas, B.Sc.: "Some Modern Developments in Automatic Switch Gear."

February 25th.—Annual Dinner.

March 8th.—Miles Walker, M.I.E.E.: "The Short-Circuiting of Large Electric Generators, and the Resulting Forces on Armature Windings."

March 22nd.—Annual General Meeting.—W. Pollard Digby, A.M.I.E.E., and D. B. Mellis: "Some Properties of Switch and Transformer Oils."

On Friday last the chairman, Mr. S. J. Watson, delivered his inaugural address.

SOUTH AFRICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—The seventh annual meeting of this Association was opened at Bloemfontein on Monday, September 27th. His Excellency the Governor delivered the presidential address on the "Application of Chemistry to Agriculture."

INSTITUTION OF ELECTRICAL ENGINEERS (BIRMINGHAM LOCAL SECTION).—The book of rules, list of members, &c., has been issued, and gives the dates of meetings in the new session, which opens on November 3rd with the inaugural address of the chairman, Mr. R. K. Morcom. The annual dinner will take place on November 12th at the Grand Hotel, Birmingham; applications for tickets should be sent to the hon. secretary, Mr. H. B. Matthews, Winchester House, Victoria Square, Birmingham.

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON).—The opening meeting will take place on November 11th, when premiums will be presented, and the President, Dr. Gisbert Kapp, will deliver his inaugural address.

INSTITUTION OF CIVIL ENGINEERS.—The Council has made the following awards, amongst others, for the year 1908-9: Telford Gold Medals to Prof. B. Hopkinson, M.A., B.Sc. (Cambridge), and Mr. G. R. G. Conway (Monterey, Mexico); Watt Gold Medals to Messrs. D. A. Matheson (Glasgow) and W. C. Popplewell, M.Sc. (Stockport); George Stephenson Gold Medals to Messrs. E. H. Tabor (London) and A. J. Knowles, B.A. (Cairo).

The Electric Driving of Textile Factories.—We publish elsewhere in this issue the interim report of the special committee of inquiry appointed by the Bradford Engineering Society on this subject. The report bears on its face indications of partisan tendencies which compel us to regard it with grave suspicion. Why, for instance, wherever possible, are saving clauses inserted to discount the advantages of electrical driving? Where are "known methods of destroying synchronous vibrations" employed? Where is "some form of power meter" worthy the name in use in connection with a mechanical drive? The Committee has been nearly two years at work, and yet produces no details of tests or other data. Were the members of the Committee unanimously in favour of the conclusions put forward in this report? The impression left upon our minds is that the report constitutes merely an attempt to "damn with faint praise" electric driving, and we regret to have to say that we have no confidence in its findings, nor can we regard it as a serious contribution to knowledge.

National Institution of Apprenticeship.—The first list of contributions to the funds, in response to the Lord Mayor's recent appeal, amounts to upwards of £470; but a sum of £13,000 is needed. Donations may be sent to the Lord Mayor, the Right Hon. Lord Avebury, 15, Lombard Street, E.C., or to the Hon. Secretary, Mr. J. S. Ballin, 39, York Place, Baker Street, W.

Glasgow and Unemployed.—The various departments of the T.C. have been asked to report on what work they can provide for the unemployed during the incoming winter, when a continuance of the distress is expected. The Tramways Committee reports that about 50 men will be required in connection with the roads leading to and the erection of the proposed new car depôts, while the Electricity Committee states that about 100 men will be employed for four or five months in connection with the new extension of the generating station at Port Dundas (already reported in the REVIEW).

Copper.—European visible supplies, as shown by Messrs. Merton's circular, continue to rise. The return for October 15th is 96,612 tons, an increase of 2,761 tons on that for the end of September. About 2,000 tons of this increase is to be found in Standard copper in English ports, the remainder being afloat from Chile and Australia (increase 500 tons). So far as can be judged from the mid-monthly figures, American supplies are below the average, Spanish to this country considerably so, while shipments from Chile and Australia remain steady.

Ice-Making Machinery.—A correspondent having inquired the cost and size of plant, space occupied and power required to produce 1 ton of ice per day, with a motor-driven compressor, Mr. F. H. Davies replies as follows:—

Replying to "L. E. W.'s" inquiry: Without a full knowledge of the local conditions, it is impossible to say which would be the best type of machine to employ for producing 1 ton of ice per day. Both ammonia and CO_2 plants have, to some extent, their special sphere; and while the former is, perhaps, more extensively used, there are circumstances under which CO_2 might be preferable. On this point it would be best for "L. E. W." to consult a prominent firm of manufacturers making both types, laying before them the full circumstances of the case. With regard to the remaining queries: assuming an ammonia installation, the initial cost of a motor-driven plant of the above capacity per 24-hour day, complete with a charge of chemicals, would be approximately £235. The power required would be 5 H.P., and the floor space occupied by the ice tank and compressor about 10 ft. × 13½ ft. The motor can, of course, be fixed to the ceiling or the wall, but if both these alternatives are impossible, floor space must be allowed for the motor and its drive. The particular machine the writer has in mind turns out the ice in 17-lb. blocks measuring approximately 3 in. × 7 in. × 24 in.

With regard to the expense of running: in addition to the cost of current, repairs, wages, depreciation allowance and capital charges, it is necessary to take into account the cost of the condensing water. With a 20-cwt. machine about 150 gallons of water per hour will be required, and unless it can be used for other purposes after having passed through the machine, it will have to be wasted. There are also further items for ammonia and sealing oil for the glands, which, together, may amount to about £5 per annum.

Holmes v. Associated Newspapers, Ltd.—With reference to the judgment in this action, which is reported on another page, we are informed as we go to Press that notice of appeal is being given.

The Departmental Committee on Electricity in Mines.—It is announced that the Home Secretary has appointed a Departmental Committee to inquire into the working of the existing special rules for the use of electricity in mines, and to consider whether any, and, if so, what, amendments are required. The Committee is composed of Mr. R. A. S. Redmayne, His Majesty's Chief Inspector of Mines (chairman), Mr. Charles H. Merz, and Mr. Robert Nelson, His Majesty's Electrical Inspector of Mines. It is stated that correspondence may be addressed to Mr. Nelson, at the Home Office.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The Hoylake U.D.C. has decided to increase the salary of its electrical engineer, MR. TURNER, by £20 per annum.

General.—At Wednesbury recently, MR. J. L. ANDREWS, electrical engineer at the Patent Shaft Works, was presented with an illuminated address and a cheque for £22, subscribed for by nearly 600 of the employés, on the occasion of his leaving the firm after 10 years' service.

MR. GEORGE MALLET, late of the Bolton Electricity Works, has been appointed electrical engineer to the Afghan Government, with headquarters at Kabul.

MR. ALBERT E. WILKES, formerly engaged in the service of the D.P. Battery Co. and the Chloride Electrical Storage Co., has been appointed storage battery engineer to the Canadian General Electric Co., Ltd., of Toronto, who are sole agents for the Electric Storage Battery Co., of Philadelphia.

ALDERMAN T. B. WATSON, Mayor-Elect of Stockton-on-Tees, is head of the firm of T. B. Watson & Son, electrical engineers, Bishopton Lane.

MR. E. S. FRANKLIN, chief electrical engineer of the Bengal-Nagpur Railway Co., who is at present staying in London (communications will reach him if addressed c/o the company, at 132, Gresham House, E.C.), will conclude his nine months' furlough in England shortly. He will return to India early in December, and would like to receive from manufacturers particulars of electrical apparatus specially applicable for use in locomotive workshops, and also telegraph and telephone work. The Bengal-Nagpur Railway Co. now have extensive workshops worked entirely by electricity on the D.C. 220-volt system. Mr. Franklin is specially interested in any advances recently made in the application of electricity to tool hardening and tempering furnaces, driving portable tools, control gear for large motors, lighting of shops, &c.

Obituary.—FRANCIS HASTINGS MEDHURST.—It is with profound regret that we record the untimely death of Mr. F. H. Medhurst, B.Sc., M.I.E.E., which occurred under most tragic circumstances on Tuesday morning at the King's Arms Hotel, Croydon, at the age of 38 years. From the Press reports it appears that the deceased gentleman was originally educated for the Indian Civil Service. He was apprenticed to Messrs. C. A. Parsons & Co., of Newcastle-on-Tyne, and some 16 years ago—at the age of 22—he opened an office at Westminster as a consulting electrical engineer. It was in this capacity that he was engaged in partnership at Victoria Street, S.W., as Medhurst & Brewer, at the time of his death. During his electrical career he had acted as consultant for a number of undertakings in this country and abroad, the original municipal and workhouse installations at Fulham being among them. In recent years, however, he had turned his attention enthusiastically to politics, and twice he unsuccessfully contested West Islington Parliamentary seat in the Unionist interest. He was the founder of the Trade Unionist Tariff Reform Association, and was only recently adopted as the Conservative candidate for Borough of Stafford. Recently Mr. Medhurst had been spending a good deal of his time abroad. It appears that he left his office last Saturday with the intention of journeying to Paris, but it seems that he never went there. On Monday night he engaged a room at the hotel named, and next morning, after writing a letter to the landlord apologising for the trouble to which he was putting him, he, it is reported, shot himself in the head, death ensuing a few minutes after his admission to the Croydon Hospital.

MR OSWALD HAES, M.I.E.E., to whose death we alluded briefly in our last issue, had been in ill-health for several years, and was only 44 years of age. Supplementing the particulars which have already appeared regarding his life and work, we are now able to add that in October, 1904, Mr. Haes attended the Electric Conference in Melbourne as the engineer of the Brush Co. at Sydney. In July, 1896, he installed the electric light in the steamship *Airlie*, belonging to the E. & A. Co. at Sydney. In August, 1901, he read a paper before the Electrical Association of New South Wales, on "Electric Power Transmission Plant at Rotorua, New Zealand," and in June, 1904, he opened a discussion at a meeting of the Electrical Association on "Economies in Electricity Supply Stations." In July, 1904, Mr. Haes was associated with the installation of the new electric light system of Sydney.

NEW COMPANIES REGISTERED.

Magneto Co., Ltd. (105,528).—This company was registered on October 21st, with a capital of £500 in £1 shares, to acquire the business belonging to H. W. van Raden and J. J. Horne, formerly carried on by them at Dreadnought Works, Phillip Street, Aston, as the Magneto Co., and to carry on the business of magneto and electrical manufacturers, dealers and inventors, manufacturers of and dealers in motor-cars, engines and fittings, &c. The subscribers (with one share each) are:—J. Woodward, 92, Station Road, King's Norton, accountant; Dorothy L. Shepherd, 91, Jakeman Road, Balsall Heath, Birmingham, typist. Private company. The number of directors is not to be more than five: J. J. Horne is the first. Registered office, Dreadnought Works, Phillip Street, Aston.

Howe Electrical Engineering Co., Ltd. (105,542).—This company was registered on October 22nd, with a capital of £5,000 in £1 shares, to take over the business carried on at 16, Redcross Street, and 14a, Moor Street, Liverpool, and at 24, New Road, Blackburn, as the "Howe Electrical Engineering Co." The subscribers (with one share each) are:—S. Lord, 20, Roxburgh Avenue, Birkenhead, electrical engineer; L. F. S. Sington, 47, Hamilton Terrace, St. John's Wood, N.W., electrical engineer. Private company. The first directors are S. Lord, J. W. Garsden, 5, Hope Terrace, Duke's Brow, Blackburn, and L. F. S. Sington. Registered office, Mersey Railway Buildings, 18, James Street, Liverpool.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Delhi Electric Tramways and Lighting Co., Ltd. (88,758).—Issue on March 29th of £2,000 and on May 20th of £2,000 debentures, parts of a series of which particulars have already been filed.

Electrolytic Alkali Co., Ltd. (64,360).—Issue on October 11th of £3,200 debentures, part of a series of which particulars have already been filed.

CITY NOTES.

Paris Compressed Air Co.

AT the end of May reference was made in this journal to a reported transaction between a French syndicate headed by the Société Générale and the Banque de Paris et des Pays Bas and a German group in regard to the latter's extensive holding of shares in the Compagnie Parisienne de l'Air Comprimé, Force Motrice et Eclairage Electrique. Negotiations on the subject were certainly in progress at the time, but the French group were indisposed to

accept the terms proposed by the group led by the Disconto Gesellschaft, and the operation was not completed. The negotiations were, however, recently re-opened, and it is understood that the French banking institutions have now accepted the conditions proposed a few months ago whereby the shares will be disposed of at the rate of 145 per cent., which will yield the Disconto Gesellschaft a book profit of from £250,000 to £300,000.

The transaction recalls the fact that the Paris lighting company in question was very largely of German origin; it has indeed been termed a German undertaking. In 1890 the Disconto Gesellschaft formed the Internationale Druckluft und Elektrisitäts Gesellschaft with a share capital of £1,500,000. The company acquired the patents of Victor Popp, of Paris, and the Compagnie Parisienne de l'Air Comprimé was constituted to work them, the former company holding the majority of the latter's shares. Owing to unfavourable results the Paris company was compelled to reconstruct its share capital in 1898 by reducing it from £800,000 to £320,000, and then raising it to £1,000,000. The new shares were taken over by the parties principally interested, who had to renounce a claim for £348,000, represented by interest and money due. The Internationale Druckluft und Elektrizitäts Gesellschaft had to subscribe £492,000 of the new shares and release £260,000 in interest and money due, whilst the company's total loss, including that resulting from the reduction in the share capital, amounted to £600,000. As a consequence the International Co. in turn was compelled to reduce its capital by one-half, and the name was changed to that of the Internationale Elektrizitäts Gesellschaft.

Since the reconstruction of the finances of the Compagnie Parisienne de l'Air Comprimé, the position of the undertaking has improved, not from the compressed air business but from the lighting concession which expired in 1907, and was extended to 1913. No dividend was paid down to the year 1906, the profits being allocated to a special reserve fund which amounted to £1,360,000, and out of which the sum of £200,000 was repaid on old advances, and thus enabled the International Co. to return this amount to its shareholders. The Paris Co. was able to distribute 6½ per cent. to its proprietors in each of the years 1906-7 and 1907-8. As the operations of the International Co. in the course of years were limited to its holding in the Paris Co., it was decided to dissolve it in 1908 in order to obviate expenses, and the shares were accordingly transferred to a group under the lead of the Disconto Gesellschaft, the first liquidation balance-sheet showing security assets of £461,400 representing substantially the value of the interest in the Paris Co.

It is considered that the present assumption of the shares by French banking interests is principally due to the circumstance that the concession held by the various electric lighting companies in Paris will expire with the year 1913, when a new company—the Compagnie Parisienne de Distribution d'Electricite—will control the supply, and in which the compressed air company has secured a large interest. The new company is financed by the Société Générale and the Banque de Paris et des Pays Bas which are also the principles in the acquisition of the shares from the Disconto Gesellschaft. On the other hand, the German interests have preferred to dispose of their holdings at a profit, rather than keep them, as the social conditions in Paris, particularly the recurring strikes, might act as an obstacle to the further development of the undertaking in that city.

Drake & Gorham, Ltd.

At the annual meeting held on Wednesday last week, Mr. B. M. Drake, in moving the adoption of the report (see Electrical Review, October 15th, page 627), said that the financial results were not as favourable as those of the previous year, and this would scarcely come as a surprise when the depressed state of the country during the period was borne in mind. The prevailing sense of insecurity amongst owners of property, and the necessity for avoiding anything in the nature of a luxury, had caused a reduction in turnover, besides which the stagnation in trade, especially in Lancashire, had stopped the firm's progress in the electrification of mills. Owing to the new conditions brought about by the advent of metal lamps, the value of individual contracts was enormously reduced; and although a considerable influx of business in lighting small houses was anticipated (for the public were beginning to appreciate the fact that electric light was now the cheapest form of illuminant, and undoubtedly the best to install even in the smallest houses), yet it must be remembered that these small houses required as much individual attention as larger contracts, so that it remained to be seen whether a corresponding advantage would accrue to the company from a financial point of view. In any case, the cost had hitherto been the deterrent to a more general adoption of electric light, and that objection might now be taken as having been removed. The firm's trade department for the wholesale supply of metal lamps to the trade and large users had been very busy, a number of important contracts having been secured. This department was worked independently, so as to remove any scruples which contractors might have in dealing with possible rivals. From the large increase in the number of accounts that had been opened with contractors, it was evidently appreciated not only that their interests were safeguarded but that there was a distinct advantage in dealing with a firm which was thoroughly conversant with their requirements under all conditions. In the motor-car department arrangements had been concluded during the year, in conjunction with Messrs. Thrupp & Maberly, for working the sole agency for the Riley motor-car for the southern counties and a general agency elsewhere. They were, however, also acting as buying agents for any well-known make of large or small cars. The chairman proceeded to give names of some of the principal clients for whom lighting contracts had been carried out during the year. They had equipped with light and some power a large bleach and cotton works at Milford for the English Sewing Cotton Co., and had acted as buying agents for well-known mining companies in Africa. A list of contracts now in hand was next given. The firm's factory had, in addition to meeting their own requirements, manufactured switchboards and other apparatus for the War Office, Buckingham Palace, Houses of Parliament, Royal Hospital, Chelsea, Maidstone Corporation, Buxton District Council, Mexborough Corporation, Duke of York's Schools, Dover, and others. As a result of their experience with suction-gas producers for use in connection with gas engines, they had been able, in conjunction with a well-known expert, to place upon the market a producer of their own. A number of these had been put to work, and they were giving better results than they had been able to obtain with any other make on the market. Although the dividend was below what it had been in previous years, this was due to special conditions which he trusted might soon be changed. Their aim was still, as ever, to do only first-class work at the lowest possible figure consistent with the use of materials and labour which would maintain their reputation. He felt sure that the moment the general condition of the country improved they would be able to show better returns to the shareholders.

The report was adopted, and a dividend of 2½ per cent. on the ordinary shares was approved.

Edison & Swan United Electric Light Co., Ltd.

The directors' report states that the net revenue account for the year ended June 30th, 1909, shows that the sum of £26,836 has been brought forward from profit and loss account. Interest on debenture stocks has absorbed £15,702; £5,500 has been set aside as depreciation on freehold and leasehold property, plant and tools; £4,000 has been applied in writing down values of stocks, and the sum of £1,213 has been reserved on account of bad and doubtful debts. The result, as shown in the net revenue account, is a credit balance of £421, to which must be added the sum of £9,606 brought forward from the previous year, thus making a total of £10,027, which the directors propose to carry forward. Cost of establishing the business, goodwill, &c., £390,432, has been brought forward at the figure standing in the last balance-sheet. The freehold and leasehold property and plant have also been brought forward at the value stated in the last balance-sheet, with the addition of the amount expended to June 30th, 1909, less depreciation charged in net revenue account. The shares of the Altrincham Electric Supply, Ltd., have been taken at par, as in previous years. This concern continues to be satisfactory, and has paid a dividend on its shares of 7 per cent. for the year ended December 31st, 1908. Its indebtedness to this company has been reduced during the year by £155. There has been expended on capital account during the year ending June 30th, 1909, £19,813, almost entirely on account of additions to buildings and plant in connection with the manufacture of metal-filament lamps. The manufacture of metal-filament lamps has been considerably extended during the year, and the satisfactory results attained justify the directors in looking forward to a large and remunerative trade in the future. The directors regret to announce the death of their colleague, Mr. H. Wolfenden, jun. Mr. Wm. Murray has been elected to fill the vacancy. Mr. Eustace C. Quilter has also been elected a director.

Stock Exchange Notices.—Applications have been made to the Committee to appoint a special settling day in and to grant a quotation to:—

Northern Light, Power and Coal Co.—$2,000,000 first mortgage 5 per cent. 20-year gold bonds.

To appoint a special settling day in:—

Marconi's Wireless Telegraph Co.—Further issue of 25,569 7 per cent. cumulative participating preference shares of £1 each, fully paid, Nos. 626,081 to 652,649.

And to allow the following securities to be quoted in the Official List:—

Edmundson's Electricity Corporation.—£55,543 5 per cent. prior lien debenture stock.

Underground Electric Railways Co. of London.—£1,000,000 4 per cent. first power house debentures, Nos. 1 to 2,500 of £100, 2,501 to 3,000 of £500, and 3,001 to 3,500 of £1,000 each.

Prospectuses.—*The Rubber Estates of Kedah, Ltd.*—This company has been offering for subscription 700,000 shares of 2s. each at par. It is acquiring estates in the State of Kedah, on the bank of the Krian River, which divides Kedah from Perak Territories, Fed. Malay States.

Lok Kawi Rubber, Ltd.—100,000 guaranteed shares of £1 each have been offered for subscription. The concession to be acquired is in British North Borneo. 5 per cent. per annum is guaranteed by the Government for six years.

Clyde Valley Electrical Power.—At the half-yearly meeting held in Glasgow, Mr. James Mackenzie presiding, it was reported that the accounts showed a credit balance on net revenue account on the half-year's working of £4,084, which had been carried forward. Contracts for the supply of power to the extent of 27,725 H.P. had been entered into as at June 30th, 1909, an increase of 3,344 H.P. on the half-year.

Monte Video Telephone Co., Ltd.

The annual ordinary general meeting was held on Wednesday at Winchester House, Old Broad Street, Mr. Chas. Lock presiding.

In moving the adoption of the report (see Electrical Review, October 22nd, page 667), the Chairman said that a comparison of the report now before them with that of the previous year would reveal a steady expansion in the company's business. The gross receipts from all sources amounted to £43,045, as against £39,261 for the previous year, an increase of some £3,800. The interest on securities was about the same. On the other hand, the working expenses had increased by some £3,000. That figure, however, included the £500 paid to their late chairman, and also included the special payment to Sir John Gavey in connection with his visit to Monte Video at the request of the board. There was also a further expense in the removal of lines caused by the pulling down of old houses in the town, which were being rebuilt on more modern lines. The increase in London office expenses was trifling, and the amount under the item of income-tax was slightly larger. The net profit for the year was £19,931, as compared with £19,400 for the preceding year, or an increase of over £500. In past years, out of this balance, they had been in the habit of appropriating an amount to the reserve fund. This year, however, they had taken the same amount, but had placed it to "depreciation." It was merely a matter of account, but if they succeeded in obtaining a concession from the Government to lay an underground plant, it would naturally entail some capital outlay, and this fund would be used for the purpose. They proposed to pay a final dividend of 2½ per cent. on the preference shares, and 3 per cent. on the ordinary, which, with the interim dividend already paid, would make a total dividend for the year of 5 per cent. on the preference and 6 per cent. on the ordinary shares. They had been in the fortunate position for the third year in succession, of declaring a 6 per cent. dividend on the ordinary shares. He thought they would all admit that was a satisfactory return. Turning to the balance-sheet, the "value of the property and capital outlay" up to July 31st, 1909, was £212,071. The real estate in Monte Video stood at precisely the same figure as last year. The investments at cost, showed a slight increase of £12,000, and their total investments for which they paid £12,688, at the present moment had a value of some £14,000. The liquid assets, debts, bills receivable, and cash, stood at £17,400, as against £10,800 for the preceding year. He thought from the figures he had given them they would agree with him that the business showed signs of steady progress. At the same time, however, he would point out that it was a business which required careful and close handling and economical managing for it to turn out profitable. The chairman then proceeded to deal at length with the question of the proposed installation of a Government undertaking, and a concession to the company for an underground plant. He said that immediately the board heard that the Government had retained an English engineer to report upon the feasibility of the Government installing a plant, they sent out Sir John Gavey, their consulting engineer, to Monte Video. That gentleman, in company with the board's legal advisers, took steps to urge upon the public authority the fair and legitimate claims of the company. So far the question had not been discussed by the legislative body, but the company understood that the President had recommended that body to consider it during the extraordinary session which was now sitting. He did not believe that the matter had been considered up to that moment, as they had heard nothing from their local representatives. It seemed to the board and to their legal advisers in Monte Video that the public had nothing to gain by the installation of a Government system. To administer a telephone system with satisfaction required a carefully-trained staff, which could not be improvised at short notice. Moreover, it appeared to the company that the profits of the business were never very large. One would therefore think that the Government would hardly find sufficient inducement to invest public money in a telephone system, and so far as the directors had been able to learn, out of a considerable amount of money voted by the Chamber for public purposes, no portion of it had been appropriated for the provision of a telephone system. Having regard to all the circumstances, they were not unhopeful that businesslike counsels would ultimately prevail, and that a concession would be granted to that company, which had for so long sought to give an efficient and up-to-date service to the Monte Video public.

Mr. G. Le Marchant seconded the motion, and the report was adopted.

Cuba Submarine Telegraph Co., Ltd.

Mr. C. W. Parish presided on Wednesday at the offices, 58, Old Broad Street, over the seventy-sixth ordinary general meeting of the above company.

In moving the adoption of the report (see Electrical Review, October 22nd, page 667), the Chairman said it represented the busy period in Cuba when the sugar mills were hard at work, and their produce was being dispatched to various ports for shipment. The success or failure of the sugar crop was naturally of extreme importance to the island, and although at one time it was feared that the prospect of a large crop was somewhat doubtful, yet a period of favourable weather during the harvest saved the situation, and the actual result turned out to be quite satisfactory. On the other hand, the tobacco crop in the western portion of the island was not good, and fell short of the previous year. Generally speaking, the conditions of the island remained much the same, which explained why their traffics were also about the same this year as last year. Although their revenue came largely from through traffic, yet they found that generally the same conditions which maintained in the island of Cuba existed also further south, excluding, of course, those occasions when earthquakes, cyclones and political disturbances brought about a special rush of Press and private traffic. The earnings for traffic receipts amounted to £15,926, as compared with £16,352 last year—a decrease of £426. The interest for investments was £1,772, against £1,719, and, with transfer fees, they finally arrived at total receipts of £17,706, against £18,079, or a reduction of £400. Really the reduction was less than that, because in the sum of £16,352 was included £194 belonging to the previous half-year, and, consequently, the decrease in traffic only amounted to £232. On the other side of the account they would find that the expenditure amounted to £6,635, against £6,523 in the corresponding six months of last year, and the slight increase was more than accounted for in the item for expenses at stations, and was due to some small cable repairs which figured at £524. The results enabled them to place £3,000 to the reserve fund, pay the usual dividend at the rate of 10 per cent. on the preference shares, amounting to £3,000, and to pay a dividend on the £160,000 ordinary share capital at the rate of 6 per cent. per annum free of income-tax. He thought they might again be satisfied with such results, especially in a period when, generally, business from one cause or another was greatly depressed in many ways. Their reserve fund now stood at the respectable figure of £114,000, but they would not let it stop there, for they had to remember that each year increased the age of their cables, and the reserve fund contained the provision they made for their gradual depreciation. Most of them were acquainted with the working of cable companies, and knew the way to maintain the value of their property was to have a strong reserve capable of meeting any calls which might be made upon it. All the cables were in good working order, and they had no difficulty in dealing rapidly and accurately with all the traffic they had. In conclusion, the Chairman mentioned with great regret that he had asked his colleagues to relieve him of the duties of chairman, and Mr. Keith had agreed to take his place. He had been a director for 18 years and chairman for 14, and there was no board more united in their policy and in the conduct of their business. They had always worked together in perfect harmony to the best of their ability for the good of the company, in which they had always been greatly assisted by their most efficient secretary, Mr. Scott. Mr. Keith had been closely connected with the company for 33 years, either in Cuba or in this country.

Mr. Geo. Keith seconded the motion, and it was carried.

Replying to a Shareholder, the Chairman said he was not retiring from the board, but he had not been well of late, and had to knock off some of his work.

Allis-Chalmers Co.

The annual report for the year ended June 30th, 1909, as quoted in the *Electric Traction Weekly*, shows that total earnings, after deducting cost of manufacturing and selling, taxes, general expenses, &c., were $1,809,009; and net earnings were $135,431. During the year the company suffered with other industrial corporations from a business depression, which, existing with fluctuating severity for three-quarters of the preceding year, continued with little change throughout the first half of the fiscal year ended June 30th, 1909. This condition was reflected in the volume of the company's sales, which compelled the works to be operated during the year at about 50 per cent. of their normal capacity, and although improved methods decreased the cost of production, yet the fixed charges (interest, taxes, insurance, depreciation, &c.), necessarily continued nearly constant, and prevented the company from showing for the year larger net earnings. New business booked commenced to show substantial gains in January last, and for the last half of the year averaged per month nearly 65 per cent. more than the monthly average for the first half. This increase with advancing prices has continued to the present time.

In a supplemental report it is stated that for the three months of the current fiscal year the expectations expressed in the annual report of an "increasingly heavy volume of orders," have been realised to the extent of a regular increase in amount for each month. "In September the total amount of business booked exceeded every month but one since the organisation of the company, and for the present month (October) there was an equally favourable prospect."

Parsons Marine Steam Turbine Co.—The report for the year ended June 30th states that the profits, after providing for depreciation on buildings, plant, machinery, and office furniture, upkeep of patents, &c., and transferring £5,171 to the experimental work account and £5,000 in reduction of patent rights account, amount to £26,699. The amount available for distribution is £36,941. The directors recommend a dividend at the rate of 10 per cent. per annum (of which an interim dividend of 5 per cent. has been paid) and a bonus of 2½ per cent., leaving £10,531 to be carried forward.

Western Telegraph Co., Ltd.—The directors have, after transferring £90,000 to the general reserve fund, £5,000 to the maintenance ships' reserve fund, £10,000 to the marine insurance fund, and £10,000 to the land and buildings depreciation fund, decided to recommend a final dividend of 3s. per share, making with the previous distributions, a total dividend of 6 per cent. for the year ended June 30th, 1909, and also the payment of a bonus of 2s. per share, both free of income-tax. The balance of the account is carried forward.

MARKET QUOTATIONS.

Wednesday, October 27th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric .. .. per cwt.	5/-	..
a „ Nitric .. .. „	22/-	..
a „ Oxalic .. .. „	28/-	..
a „ Sulphuric .. .. .. „	5/6	..
a Ammoniac, Sal .. .. .. „	42/-	..
a Ammonia, Muriate (crystal) .. per ton	£29	..
a „ „ .. .. .. „	£30	..
a Bleaching powder .. .. .. „	£5 10	..
a Bisulphide of Carbon .. .. „	£18	..
a Borax .. .. „	£16	..
a Ferro-Silicon (50 %) .. .. „	£11	..
a Copper Sulphate .. .. .. „	£18 10	..
a Lead, Nitrate .. .. .. „	£26 10	..
a „ White Sugar .. .. .. „	£23 10	..
a „ Peroxide .. .. .. „	£32	..
a Methylated Spirit .. .. .. per gal.	2/6	..
a Potassium, Bichromate, in casks per lb.	8½d.	..
a Potash, Caustic (75/80 %) .. per ton	£20	..
a „ Chlorate .. .. .. per lb.	8½d.	..
a „ Perchlorate .. .. „	8½d.	..
a Potassium, Cyanide .. .. „	7d.	..
a Shellac .. .. per cwt.	75/-	..
a Sulphate of Magnesia .. .. per ton	£4 10	..
a Sulphur, Sublimed Flowers .. „	£6 10	..
„ Recovered .. .. „	£5 10	..
a „ Lump .. .. .. „	£5	..
a Soda, Caustic (white 70 %) .. „	£10 15	..
a „ Chlorate .. .. .. per lb.	3½d.	..
a „ Crystals .. .. .. per ton	£3 5	..
a Sodium Bichromate, casks .. per lb.	3d.	..
a „ Cyanide (basis 100 %) .. „	7d.	..
METALS, &c.		
b Aluminium Ingots, in ton lots .. per ton	£75	..
b „ Wire, in ton lots .. „	£112	..
b „ Sheet, in ton lots .. „	£120	..
p Babbitt's metal ingots .. .. „	£50 to £136	..
c Brass (rolled metal 2" to 12" basis) per lb.	7½d.	..
c „ Tube (brazed) .. .. „	8¾d.	..
c „ „ (solid drawn) .. „	7½d.	..
c „ Wire, basis .. .. .. „	6¾d.	..
c Copper Tubes (brazed) .. .. „	8¾d.	..
c „ „ (solid drawn .. „	8¾d.	..
g „ Bars (best selected) .. per ton	£70	£1 dec.
g „ Sheet .. .. .. „	£70	£1 dec.
g „ Rod .. .. „	£70	£1 dec.
e „ (Electrolytic) Bars .. „	£60 10	..
e „ „ Sheets .. „	£77	..
e „ „ Rod .. „	£65 10	..
e „ „ H.C. Wire per lb.	7¼d.	..
f Ebonite Rod .. .. .. „	3/3	..
f „ Sheet .. .. .. „	3/-	..
n German Silver Wire .. .. „	1/6	..
h Gutta-percha, fine.. .. .. „	5/6 to 6/6	..
h India-rubber, Para fine .. .. „	9/-	3d. inc.
i Iron Pig (Cleveland warrants) .. per ton	51/3	6d. dec.
l „ Wire, galv. No. 8, P.O. qual. „	£14	..
g Lead, English Ingot .. .. „	£13 5 to £13 10	5/- dec.
m Manganin Wire No. 28 .. .. per lb.	6/6	..
e Mercury .. .. per bot.	£8 17 to £8 17 6	inc.
d Mica (in original cases) small .. per lb.	6d. to 1s.	..
d „ „ „ medium „	2/6 to 4/-	..
d „ „ „ large .. „	4/6 to 8/6	..
p Phosphor Bronze, plain castings „	1/- to 1/1½	..
p „ „ rolled bars & rods „	1/1½ to 1/3	..
p „ „ rolled strip & sheet „	1/2½ to 1/6	..
o Platinum .. .. per oz.	111/6	variable.
e Silicium Bronze Wire .. .. per lb.	9d.	..
r Steel Magnet, in bars .. .. per ton	£55	..
g Tin, Block (English) .. .. „	£135 10 to £136 10	£1 inc.
n „ Wire, Nos. 1 to 16 .. .. per lb.	1/9	..
p White Anti-friction Metals:—		
"White Ant" brand .. .. per ton	£35 to £60	..
k Zinc, Sh't (Vieille Montagne bnd.) „	£27	10/- inc.

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

Hurst, Nelson & Co, Ltd.—According to the *Times*, the report for the year ended July 17th states that the accounts, after deduction of repairs, directors' fees, management salaries, and all other charges, show a gross profit of £33,283, and deducting income-tax, interest on the purchase price of the business from July 18th, 1908, till settlement, and bank interest (£9,270), depreciation on machinery, plant and wagon stock (£11,903), and portion of expenses of forming the company (£1,200), there is a balance of £10,910. The directors recommend a dividend at the rate of 6 per cent. per annum on the preference share capital from May 15th to July 17th, 1909, placing to special reserve fund for security of dividend on preference share capital £686, and carrying forward £6,170.

Electrolytic Alkali Co.—The annual report, according to a financial contemporary, shows a net profit for the year, after allowing for depreciation, debenture interest, general upkeep, &c., of £11,919, making, with the balance brought forward, a credit balance of £22,174. There are now three years' dividends due on the preference capital. The directors propose to pay 12 months' dividend and to carry forward £15,177.

STOCKS AND SHARES.

Tuesday Afternoon.

The Stock Exchange has once more drifted into troubled waters. Three rises of the Bank Rate in as many weeks were quite enough to upset the balance of the markets. The usual over-trading evidences stand revealed in the shape of what the newspapers call an unwieldly bull account. Liquidation of this has led to losses that had to be made good by realisations of investment securities, and the consequence is that prices all round are either dull or weaker. Flickers of occasional revivals, however, show that all is not yet over between the Stock Exchange and its clients.

That improvements in electrical issues should this week be scarce as strawberries goes almost without saying. There are, in fact, very few departments in the markets to which the same remark would not be equally applicable.

Pronounced flatness in the Home Railway market was one of the first results of the rise in the Bank Rate to 5 per cent. A faint recovery set in early this week, but it failed to wipe out the whole of the previous losses of which the electrical stocks had had their full share. Metropolitan Consolidated and Surplus Lands stocks are both lower. Districts sagged away to 16¼. Underground Electric Railway 4½ per cent. bonds fell a point. City and South London eased off, but managed to regain the loss, the forthcoming revision of certain of the fares being put forward as one explanation for the support. There have been no alterations in Central London stocks.

Amongst electricity supply issues, the few changes are downward, except as regards a small further rise in River Plate Ordinary shares, which have risen to 1⅝. There are small declines in London Electric Ordinary and in Metropolitan Ordinary. The threatened closing of the Crystal Palace has been ignored as a market factor in any way, and none of the electrical companies' shares are affected. A slump in South African mining shares caused Victoria Falls Power Preference to ease off, but the reduction is extremely slight.

Directors of electricity supply undertakings might well make a note of the example of a well-known suburban gas company which, along with its demand notes for payment of the Michaelmas accounts, has distributed a little slip stating that it is about to issue some more of its stock, and inviting customers to apply for particulars. As an inexpensive way of making a new issue of stock, the procedure might commend itself to those interested in such matters.

Rio Trams at 90 are flat, showing a drop of 3 points. Mexico Tramways and the company's bonds are 1 down, while Mexican Light and Power Common and Preference are 1 and 2 points lower respectively. Canadian General Ordinary and Preferred have come into line at 120. British Columbia Electric Railway Deferred fell 1, after its substantial rise, but the Preferred gained a further 2 per cent. Anglo-Argentine Tramways are dull, both as regards the shares and the Debenture stock. British Electric Traction Preference maintained their improvement, and British Westinghouse 4 per cent. Debenture at 43 exhibits a gain of 1½. A little speculative buying was stimulated by the better reports, quoted here last week, which are being received as to the progress of the American Westinghouse Company.

As American Railway shares are jumping violently and irregularly, the trans-Atlantic wire varieties are mostly rather lower. Anglo-American Telegraph Deferred naturally gave way, and Direct United States shares are easier. Commercial Cable Debenture drooped, American Telegraph and Telephone capital stock fell 2. New York Telephone scrip has kept wonderfully firm, considering the circumstances, at 2¾ premium for cash. Great Northern Telegraphs rose 30s.

Eastern Telegraphs and Eastern Extensions developed dullness, and West Coast of America shares are a trifle easier.

United River Plate Telephones reacted ½ after their good and steady rise. Monte Videos, however, are strong; although, on the other hand, Oriental Telephones are rather lower. In the National Telephone list, the only change is a fall of 1 in the price of the Deferred stock.

Manufacturing issues are quiet and featureless. The Edison and Swan issues did not move, on the announcement that the company will pay no dividend on its Ordinary shares. Electric Construction Debenture rose a point. Rubber shares are fluctuating freely, and the prices on balance show slight losses as compared with those of a week ago.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the five weeks ended October 1st, 1909, were 974,050, compared with 782,821 units in the corresponding five weeks of 1908.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Oct. 19th.	Closing Quotations Oct. 26th.	Business done week ended Oct. 26th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	8 — 8¼	8 — 8¼	..	..	..	Nil.
126,700	Do. do. 5 % Debs., Nos. 1 to 1,260 Red.	100	5 %	5 %	5 %	5 %	95 — 98	95 — 98	95½	..	..	5 2 0
£131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½ %	8 %	8 %	8 %	145 —147	143 —145	..	..	—2	5 10 4
£33,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 58,001 to 78,000	$1000	4 %	4 %	4 %	4 %	96 — 98	96 — 98	..	..	..	4 1 8
568,460	Anglo-American Telegraph	Stock	3½%	3½%	3½%	£3 4s.	61 — 63	61 — 63	..	..	..	5 8 2
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	102 —108	102 —108	102½	101	..	5 16 6
3,220,770	Do. do. do. Deferred	Stock	½%	1½%	1 %	8/-	21½ — 21¾	21⅜ — 21⅝	21 1/16	21	— ⅛	1 16 11
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	101 —103	101 —103	..	..	..	4 17 1
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	8 — 8¼	8 — 8¼	8	..	..	4 14 1
2,421,350	Commercial Cable, Sling. 500 year 4% Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	88 — 90	87 — 89	89	..	—1	4 9 11
16,000	Cuba Telegraph	10	5 %	6 %	6 %	6 %	8⅝ — 9⅜	8⅝ — 9⅜	..	..	..	6 8 0
5,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	17½ — 18½	17⅛ — 18⅛	..	..	..	5 8 1
12,921	Direct Spanish Telegraph, Ord.	10	4 %	4 %	4 %	4 %	3 — 3¼	3 — 3¼	..	..	..	5 14 8
5,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8 — 8¼	8 — 8¼	..	..	..	6 5 0
20,000	Do. do. 4½ % Debs.	20	4½%	4½%	4½%	4½%	9 — 9¼	8 — 8¼	..	..	..	2 3 11
60,710	Direct United States Cable	100	4½%	4½%	4½%	4½%	100½—102½	100½—102½	13⅛	..	— ⅛	6 4 7
43,500	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,300, R.	20	4½%	4½%	4½%	4½%	13¼ — 13⅝	13 — 13⅜	..	..	..	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock..	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
2,900,000	Do. 8½ % Pref. Stock..	Stock	7 %	7 %	7 %	7 %	127 —130	126 —129	128	127	—1	5 8 6
1,898,706	Do. 4 % Mort. Deb. Stock. Red. ..	100	8½%	8½%	8½%	8½%	84 — 86	83½ — 85½	85	..	— ½	4 1 10
300,000	Eastern Extension, Australasia, and China Tele	Stock	4 %	4 %	4 %	4 %	104½—106½	104½—106½	105½	..	..	3 15 2
759,400	Do. 4 % Deb. Stock	10	7 %	7 %	7 %	7 %	11½ — 12½	11⅝ — 12⅜	12⅜	11⅜	— ⅛	5 14 3
200,000‡	Eastern & S. Afric. Tel., 4 % Mt Db. Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	102 —104	102 —104	..	..	..	3 15 11
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	5½%	100 —102	100 —102	..	..	..	3 18 5
181,127	Do. do. 6 % Pref..	10	6 %	6 %	6 %	6 %	103— 105	103— 105	103	..	..	5 8 3
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	18 %	13⅝— 14⅜	13¾— 14	13⅝	..	— ⅜	4 5 9
10,000	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	26½— 27½	28 — 29	..	..	+1½	6 4 2
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	100 —102	100 —102	..	..	..	4 8 3
£41,280,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	51½— 53½	51½— 53½	..	..	..	6 1 6
£55,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	— ½	4 4 3
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	77 — 79	77 — 79	..	..	..	5 1 3
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	1/16— 2/16	1/16— 2/16	17/6	15/-	..	Nil
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	1/16— 2/16	1/16— 2/16	17/6	..	+ 1/16	6 8 0
2,235,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107 —108½	107 —108½	108½	107½	+ 1	5 6 8
3,735,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	121 —123	120 —122	122½	120½	..	5 10 7
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 11	10⅜— 11	..	..	..	4 18 4
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10¼— 10⅝	10⅛— 10⅝	10⅜	..	..	5 9 1
15,000	Do. do. 5 % Non-cum. 3rd P., 1 to 300,000	5	5 %	5 %	5 %	5 %	5 1/16— 5 3/16	5 1/16— 5 3/16	5 1/16	..	..	5 10 4
250,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100	98 —100	..	..	..	4 7 8
2,000,000	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 10 0
1,983,593	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	8 %	1⅝— 1¾	1⅝— 1¾	28/9	..	..	3 18 5
179,813	Do. do. do. 6 % Cum. Pref.	1	6 %	6 %	6 %	6 %	1 1/16— 1 1/16	1 1/16— 1 1/16	..	..	..	5 5 9
60,000	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	86½— 88½	86¼— 88½	..	..	..	4 14 9
99,100	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	4 10 5
99,400	Reuter's	5	5 %	5 %	5 %	5 %	7⅜— 8⅛	7⅜— 8⅛	..	..	..	3 18 5
11,880‡	Submarine Cables Trust	100	4½%	4½%	4½%	4½%	100½—102½	100½—102½	..	..	..	4 18 9
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	Cert.	6 %	6 %	6 %	6 %	129 —132	129 —132	..	..	..	4 7 10
3,042	United River Plate Telephone	5	8 %	8 %	8 %	8 %	7 — 7⅛	6⅞— 7⅛	7 3/16	7 1/16	..	4 10 11
150,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5⅝— 5⅞	5⅝— 5⅞	..	..	..	5 10 4
40,000	W. Coast of America, 1 to 30,000 & 58,001 to 68,008	2½	Nil	2½%	2½%	2½%	1 1/16— 1 1/8	1⅛— 1⅛	30/-	..	— 1/16	4 8 10
30,008	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 16 4
150,000	Western Telegraph, Ltd., Nos. 1 to 307,980.. ..	10	7 %	7 %	7 %	7 %	18½ — 14	13½ — 14	13⅝	13½	..	5 0 0
307,980	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	103 —105	103 —105	..	..	..	3 16 ..
800,000	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅛— ¼	⅛— ¼	15/-	13/9	..	Nil
88,331	Do. do. 6 % Cum. 1st Pref.	10	5 %	6 %	6 %	6 %	8½ — 9½	8¼ — 9¼	9⅛	8⅝	..	6 9 9
84,568	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	15 %	8½ — 9½	8¼ — 9¼	..	..	..	15 15 10
4,669	Do. do. 5 % Debs., Nos. 1 to 1,800	100	5 %	5 %	5 %	5 %	101½—103½	101½—103½	..	..	..	4 16 7
80,000‡												

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

640,000	Anglo-Argentine Trams, 5 % Cum. 1st Pref., 1 to 640,000	5	..	..	..	..	4⅜— 4⅝	4 1/16— 4 1/8	95/-	88/9	— 1/16	5 2
800,000	Do. 5 % 2nd Pref., 800,001 to 1,800,000	5	..	..	..	..	4 7/16— 4 1/2	4¼— 4½	95/-	..	— 1/16	5 6
978,280	Do. 4 % Deb. Stock	..	..	..	..	4 %	93 —98	91 — 92½	92½	91½	— ½	4 6 6
882,387	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —105	102 —105	..	..	..	4 15 3
880,000	Babcock & Wilcox, 1 to 880,000..	1	20 %	20 %	20 %	20 %	4 7/16— 4 5/8	4 7/16— 4 5/8	90/-	88/9	..	4 7 5
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 1/16— 1 1/8	1 1/16— 1 1/8	..	..	..	3 19 2
60,000	British Aluminium, Ord., 1 to 40,000	1	6 %	6 %	6 %	6 %	1— 1	1— 1	..	..	+ ⅛	27 6 8
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	1⅛— 2⅛	1⅛— 2⅛	..	..	..	15 1 4
40,100	Do. do. "A" 6 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3⅛— 3⅜	3⅛— 3⅜	..	..	..	7 10 11
12,897	Do. do. 4 % Funding Certs.	5	6 %	6 %	6 %	6 %	2⅜— 3⅛	2⅜— 3⅛	..	..	..	5 14 3
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	4 %	4 %	4 %	4 %	96 — 99	96 — 99	..	..	..	5 14 7
500,000	British Columbia E. Rail Def. Ord. Stock	100	..	5½%	5½%	5½%	151 —156	150 —155	153	151	—1	5 3 3
400,000	Do. Pref. Ord. Stock	100	6 %	6 %	8 %	8 %	121 —126	123 —128	124	..	+2	4 13 9
400,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	109 —112	109 —112	110½	109½	..	4 9 3
400,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	100	5 %	5 %	5 %	5 %	100 —102	100 —102	103	..	..	4 8 3
238,000	Do. 4½ % Vancouver Power Debs., 1 to 2,900	40	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
212,600	British Electric Traction	100	4½%	4½%	4½%	4½%	.. — ..	.. — ..	15/9	12/6	..	Nil
138,801	Do. do. 6 % Cum. Pref.	10	5 %	Nil	Nil	Nil	⅜— 1	⅜— 1	10/-	8/3	..	Nil
151,427	Do. do. 5 % Perp. Deb. Stock ..	10	6 %	6 %	8 %	8 %	2⅝— 2⅞	2⅝— 2⅞	3/-	2/6	..	6 0 0
1,478,658	Do. do. 4½ % 2nd Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	83½— 85½	83½— 85½	86	84½	..	5 9 1
528,986	British Insulated and Helsby Cables	100	4½%	4½%	4½%	4½%	60 — 64	60 — 64	..	..	—2	5 17 0
100,000	Do. do. 6 % Cum. Pref.	5	8 %	10 %	10 %	10 %	7⅛— 7⅝	7⅛— 7⅝	..	..	..	7 0 8
100,000	Do. do. 4½ % 1st Mort. Deb. Red..	5	6 %	6 %	6 %	6 %	6⅜— 6¾	6⅜— 6¾	..	..	..	4 11 3
500,000	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	103 —106	103 —106	..	..	..	4 4 11
904,940‡	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	100	4½%	4½%	4½%	4½%	89 — 94	89 — 94	..	..	..	4 15 9
400,000		5	Nil	Nil	Nil	Nil	⅛— ¼	⅛— ¼	..	..	..	Nil
1,816,853	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	40 — 43	42 — 44	48	42	+1½	9 1 9
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	1/16 to 1/8	1/16 to 1/8	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	1/16 to 1/8	1/16 to 1/8	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	2½%	Nil	Nil	Nil	0 — ⅛	0 — ⅛	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	Nil	0 — ⅛	0 — ⅛	..	..	..	Nil
136,000‡	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	41 — 46	41 — 46	..	..	..	9 15 8
136,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	27 — 31	27 — 31	..	..	..	14 10 2
127,610	Calcutta Trams, 1 to 127,610	5	8 %	8 %	8 %	4½%	4⅜— 5⅛	4⅜— 5	96/3	..	— ⅛	4 10 0
46,804	Do. 5 % Cum. Pref., Nos. 1 to 29,880..	5	5 %	5 %	5 %	5 %	4⅜— 5	4⅜— 5	..	..	..	5 0 0
880,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	15 %	10⅜— 11⅛	10⅜— 11⅛	10⅝	..	..	6 7 8
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5⅜— 5⅝	5⅜— 5⅝	..	..	..	4 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107	106 —107	..	..	..	4 4 1
491,222	Cape E. Trams., 1 to 491,222	1	Nil	Nil	Nil	Nil	7/16— 9/16	7/16— 9/16	5/6	5/3	..	Nil
450,000	Casner-Kellner Alkali, 1 to 450,000	1	5 %	8 %	12 %	12½%	2 3/16— 2 5/16	2 3/16— 2 5/16	48/1½	42/6	..	5 19 1
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	4 %	106 —109	106 —109	107½	..	..	3 13 5
1,890,690	Central London Railway, Ord. Stock..	Stock	4 %	4 %	3 %	3½%	60 — 62	60 — 62	61½	60	..	5 4 10
554,655	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	85 — 87	85 — 87	85½	..	..	4 14 2
554,655	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	43 — 45	43 — 45	44½	44	..	5 11 1
1,480,000	City and South London Railway	Stock	1½%	2½%	2½%	1½%	30 — 31	30 — 31	..	..	..	4 16 9
85,000	Crompton & Co., Nos. 1 to 85,000	5	3½%	5 %	5 %	5 %	⅛— 1	⅛— 1	..	..	..	15 1 8
180,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £180, and 901 to 11,999 of £50 Red.	..	5 %	5 %	5 %	5 %	90 — 93	90 — 93	..	..	..	5 7 6

* Unless otherwise stated, all shares are fully paid. † A period of nine months. From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1906.	1906.	1907.	1908.	Closing Quotations Oct. 19th.	Closing Quotations Oct. 26th.	Business done week ended Oct. 26th, 1909. Highest	Lowest	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1 — 1⅛	1 — 1⅛	21/10½	..	..	8 17 9
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000 ..	1	6 %	6 %	6 %	6 %	1 — 1⅛	1 — 1⅛	20/9	..	..	5 6 8
271,080	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	10	6 %	6 %	6 %	6 %	12⅝— 13⅜	12⅝— 13⅜	..	..	..	4 7 8
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	4⅜%	4⅜%	2⅜%	1¾%	⅜— ⅝	⅜— ⅝	8/8	..	..	27 5 4
17,139	Do. "A" shares, 01—017,139 ..	5	4⅜%	4⅜%	2⅜%	2⅜%	1 — 1⅛	1 — 1⅛	..	..	..	8 6 8
307,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	68 — 73	68 — 73	..	..	..	5 9 7
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	82 — 85	82 — 85	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	⅛— ¼	⅛— ¼	..	..	..	Nil
81,890	Do. do. 7 % Cum. Pref., 1 to 81,890..	2	7 %	7 %	7 %	7 %	1⅞— 1⅞	1⅞— 1⅞	..	..	..	9 18 1
25,000	General Electric Co. (1900), 5 % Cum. Pref. ..	10	5 %	5 %	5 %	5 %	8¼— 8⅜	8¼— 8⅜	..	..	..	5 14 3
200,000	Do. do 4 % Mort Deb... ..	Stock	4 %	4 %	4 %	4 %	83 — 87 xd	83 — 87	..	..	..	4 12 0
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	1½%	Nil	½— 1	½— 1	18/-	15/-	..	6 13 4
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½— 10⅝	10½— 10⅝	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15 %	15%	15 %	12½— 13½	12½— 13½	..	..	..	5 12 2
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5⅛— 5⅜	5⅛— 5⅜	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	106 —108	106 —108	..	..	..	4 3 4
50,000	India-Rubber, Gutta-percha & Telegraph Works..	10	10%	10 %	10 %	10 %	15 — 15⅝	15 — 15⅝	15⅛	15 16	..	6 14 3
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	½%	Nil	⅛— ¼	⅛— ¼	..	..	..	Nil
10,000	† Do. do. Pref., fully paid ..	10	5 %	5 %	5 %	5 %	4½ — 5	4½ — 5	..	..	..	10 0 0
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	Nil	1½ — 2⅛	1½ — 2⅛	..	..	..	Nil
399,930	Do. do. 50,008 to 100,000	10	3 %	3 %	3 %	Nil	1½ — 2⅛	1½ — 2⅛	..	..	..	Nil
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	3⅔%	2⅛— 2⅜	2⅛— 2⅜	..	..	..	13 12 8
1,881,000	Do. do. 4 % 1st Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	67 — 70	67 — 70	..	..	..	5 14 4
5,739,062	Metropolitan Consolidated	100	2⅜%	1 %	⅛%	⅛%	37⅜— 38⅛	37⅛— 37⅜	37⅜	37¼	— ⅛	1 6 6
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	65 — 67	64 — 66	65	64	—1	4 3 4
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	16⅛— 17	16 — 16⅛	16⅛	16	— ⅛	Nil
391,337	Metropolitan Electric Trams., Ord.	1	..	..	..	4⅛%	⅛— ⅛	⅛— ⅛	..	..	..	6 10 11
314,016	Do. do. Defd...	1	Nil	Nil	Nil	Nil	⅛— ⅛	⅛— ⅛	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref. ..	1	5 %	5 %	5 %	5 %	⅜— ⅝	⅜— ⅝	..	..	..	6 7 0
595,600	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	94⅜— 96⅜	94⅛— 95⅛	95⅛	91⅝	..	4 13 3
10,823,200	Mexico Trams Co., Common Stock	..	..	..	..	..	127 —130	126 —129	127½	126½	—1	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	5 %	92 — 94	91 — 93	92⅝	91½	—1	5 7 6
245,500	Potteries Electric Traction	1	4 %	4 %	4 %	Nil	⅛— ⅜	⅛— ⅜	..	..	..	..
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	⅛— ⅜	⅛— ⅜	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	86 — 89	86 — 89	..	..	..	5 1 2
37,350	Telegraph Construction and Maintenance	12	15 %	15 %	17½%	15 %	34½ — 36	34½ — 36	35½	..	..	5 0 0
140,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
1,000,000	Underground Electric Railway, 5% Prior Lien ..	..	..	..	..	5 %	102½—103½	102½—103½	103	102½	..	4 16 7
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	87 — 89	86 — 88	87½	86½	—1	5 2 3
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	32 — 34	32 — 34	..	..	..	..
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	5	Nil	Nil	10 %	Nil	⅜— ⅝	⅜— ⅝	..	..	..	..
66,666	Do. 6 % C.P., 80,001 to 80,000 & 125,001 to 141,666	1	Nil	..	6 %	6 %	2 — 2½	2 — 2½	..	..	..	2 8 0
245,495	Do. % 1st Mort. Deb. Stock		4 %	4 %	4 %	4 %	76 — 80	76 — 80	..	..	..	5 0 0

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000		5¼%	5¼%	5¼%	5¼%	4⅜— 4⅝	4⅜— 4⅝	..	..	..	5 2 1
70,000	Do. do. 4½ % 1st. deb. stock ..	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 18 9
80,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	10 %	6½ — 7⅛	6½ — 7⅛	..	..	..	6 13 4
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6½ — 7⅛	6½ — 7⅛	..	..	..	4 13 4
886,876	Central Electric Supply 4 % Guar. Deb. Stock ..	100	4 %	4 %	4 %	4 %	97 —100	97 —100	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply ..	5	5 %	5 %	5 %	5 %	4 — 4⅛	3⅞— 4⅛	78/9	77/6	— ⅛	5 14 3
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4⅛— 4⅜	4⅛— 4⅜	..	..	..	4 12 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅞— 4⅛	3⅞— 4⅛	77/6	..	..	5 6 11
445,736	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	98 —101	98 —101	..	..	..	3 19 3
49,486	Chelsea Electricity Supply, Ord.	5	6 %	4½%	4½%	4½%	3¾— 4	3¾— 4	71/3	..	..	5 12 6
175,000	Do. do. 4½ % Deb. Stock Red. ..	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 6
70,595	City of London Elec. Lighting, Ord. 40,001—110,596	10	6 %	6 %	6 %	6 %	10⅜— 10⅞	10⅜— 10⅞	10⅛	10	..	5 10 4
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11½— 12½	11½— 12½	12½	12⅜	..	4 12 4
400,000	Do. 5% Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 —124	121 —124	..	..	..	4 0 8
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	1½— 2	1½— 2	..	..	..	5 0 0
50,000	Do. do. do. 5 % Pref. ..	5	5 %	5 %	5 %	5 %	2½— 3⅜	2½— 3⅜	..	..	..	7 8 2
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	93½— 95½	93½— 95½	..	..	..	5 4 9
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	7⅜— 8⅛	7⅜— 8⅛	7⅝	7⅛	..	6 1 3
55,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅜— 11⅛	10⅜— 11⅛	10⅝	10⅜	..	5 7 10
400,000	Do. do. 4½ % Deb. Stock ..	..	4½%	4½%	4½%	4½%	104 —107	105 —108	106⅜	..	+1	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares ..	5	4 %	Nil	Nil	Nil	⅛— ⅝	⅛— ⅝	4/4½	..	..	Nil
80,000	Do. do. 6 % Cum. Pref. ..	5	6 %	3 %	Nil	Nil	⅛— ⅝	⅛— ⅝	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	57 — 60	57 — 60	..	..	..	7 10 0
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	..	..	5 %	91 — 94	91 — 94	..	..	..	5 6 5
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4⅜— 4⅞	4⅜— 4⅞	..	..	..	5 12 10
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	4⅛— 5⅜	4⅛— 5⅜	..	..	..	4 13 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	97 —100	97 —100	100½	..	..	4 10 6
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	8½%	6⅞— 7⅛	6⅞— 7⅛	7⅛	..	..	5 17 3
$1,976,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	99 —101	99 —101	..	..	..	4 19 0
21,000	Kensington and Knightsbridge Electric Ord. ..	5	10 %	10 %	10 %	8 %	7 — 7⅛	7 — 7⅛	..	..	..	5 4 1
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	95 — 98	95 — 98	..	..	..	4 4 3
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½%	2 %	1⅞— 2⅛	1⅞— 2⅛	..	..	..	4 18 0
70,000	Do. do. 6 % Pref. ..	5	6 %	6 %	6 %	6 %	4½— 5⅛	4½— 5⅛	5⅛	5 3/32	..	5 14 3
382,355	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½%	4½%	4 %	93 — 97	93 — 97	94	..	..	4 2 6
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½%	5 %	4⅜— 4⅝	4 — 4⅛	32/6	..	— ⅛	5 11 1
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅜— 5	4⅜— 5	..	..	..	4 10 0
285,000	Do. 4½ % 1st Mort. Deben. Stock ..	..	4½%	4½%	4½%	4½%	105 —108	105 —108	106½	..	..	4 3 4
248,000	Do. 5½ % Mort. Deben. Stock Redem.	Stock	5½%	5½%	5½%	5½%	83½— 86½	83½— 86½	84⅜	..	..	4 0 11
$6,000,000	Mexican Electric Light Co.. 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	82 — 84	80 — 82	..	..	—2	6 1 11
18,585,000	Do. Light and Power Co., Ltd., Common ..	$100	..	..	..	3½%	72 — 76	71 — 75	72⅜	..	—1	4 13 4
$2,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	105 —109	105 —109	107½	107	..	6 8 5
$19,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	86 — 88	85 — 87	87	85½	—1	5 13 8
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	97 —100	98 —100	..	..	..	4 10 0
180,491	Newcastle-on-Tyne, 1 to 187,500	5	3 %	3 %	3 %	2½%	4⅛— 4⅜	4⅛— 4⅜	..	..	..	2 14 0
187,500	Do. 5 % Pref., 1 to 187,500	5	5 %	5 %	5 %	5 %	4⅜— 5⅛	4⅜— 5⅛	..	..	..	4 15 3
126,500	{North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265}	100	..	..	..	..	99 — 101	99 —101	95/-	..	..	..
10,853	Notting Hill Electric Lighting	10	7½%	7½%	7½%	7 %	12⅛— 13⅛	12⅛— 13⅛	..	..	..	5 6 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	6 — 6⅛	6 — 6⅛	6⅛	..	..	5 7 8
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	95 — 98	95 — 98	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507 ..	1	..	2½%	6 %	8 %	1⅛— 1⅛	1⅛— 1⅛	32/6	30/9	+ ⅛	4 14 10
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6 %	6 %	6 %	6 %	1⅛— 1⅛	1⅛— 1⅛	..	..	..	5 1 1
200,000	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	103 —106	103 —106	104½	..	..	4 14 4
40,000	St. James' and Pall Mall Electric Light, Ord. ..	5	12½%	10 %	10 %	10 %	8¾— 9	8¾— 9	..	..	..	6 7 0
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	7 — 7⅛	7 — 7⅛	..	..	..	5 11 1
150,000	Do. do. 8½ % Deb. Stock Red. ..	100	8 %	8½%	8½%	8½%	84 — 88	84 — 88	..	..	..	8 19 7
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	Nil	⅛— ⅜	⅛— ⅜	..	..	..	Nil
35,000	South London Electric Supply, Ord.	4	4 %	3 %	4 %	5 %	2⅝— 3	2⅝— 3	55/-	..	..	6 13 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	2½%	1⅝— 1⅞	1⅝— 1⅞	..	..	..	4 8 11
149,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅝— 1⅞	1⅝— 1⅞	..	..	..	5 17 11
224,532	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	⅜— ⅝	⅜— ⅝	..	..	..	25 6 8
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1⅛— 1⅜	1⅛— 1⅜	..	..	..	14 5 4
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	74⅛— 78⅛	74⅛— 78⅛	..	..	..	5 14 8
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000 ..	1	..	..	..	5 %	⅜— 1	⅜— ⅝	18/9	..	+ ⅛	5 3 11
110,000	Westminster Electric Supply, Ord.	5	12 %	12 %	10 %	10 %	8¾— 9	8¾— 9	..	..	..	5 11 1
81,379	Do. do. 4½ % Cum. Pref. Reduced from 6% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5 — 5⅛	5 — 5⅛	5⅛	..	..	4 3 0

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank rate of Discount 5 per cent., October 22nd, 1909.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING SEPTEMBER, 1909.

So far as the exports are concerned, the September returns of electrical business are rather disappointing.

The gross total for the month, amounting to £260,436, compares with £302,849 in August, and is the smallest since February; it includes some £34,132 worth of telegraphic material, deducting which we obtain £226,304 as the value of general business comparable with the amount recorded by us in September, 1908, viz., £224,913.

It is possibly some consolation to know that the month's business is still above the average of 1908.

The imports, with a total of £138,462, are some £8,000 in excess of the August total, but are less than the average obtaining in 1908, while the re-exports show an improvement on the month, standing at £17,662, as compared with £15,591 in August.

In the export section the electrical machinery returns exhibit a considerable decrease in value, and this also applies to telegraphic material; cables and telephonic plant, however, show an upward tendency.

The lamp imports have increased from £25,084 in August to £33,897 in September, cable and telephonic imports are also somewhat higher in value.

India, Natal and China proved very good customers during the month, while Germany, the States and France, in the order given, were the most prominent importers into this country.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Country receiving exports and importing.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric lamps and parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	273	328	27	150	15	4,873	...	3	...	18	1,612	7,299
Germany and German West Africa	264	45	74	93	84	901	...	46	...	12	322	1,841
Netherlands and Java	323	648	24	104	114	531	...	7	...	15	3,970	5,736
Belgium	177	716	57	82	743	2,788	...	5	...	348	214	5,130
France and French West Africa	75	...	49	448	...	1,229	...	...	...	20	134	1,955
Portugal, Madeira, Portuguese Africa and India	226	224	63	233	51	2,355	409	...	16	46	973	4,596
Spain and Canary Isles	189	...	20	100	...	2,041	...	...	8	23	288	2,669
Switzerland, Italy and Austria-Hungary ...	46	40	10	54	1,089	3,313	...	334	...	112	890	5,888
Greece, Roumania and Turkey	88	74	74	26	50	309	33	69	...	9	156	888
Channel Isles, Gibraltar and Malta	99	137	12	12	...	137	466	22	...	28	1,573	2,486
U.S.A., Philippines and Cuba...	173	...	...	11	...	1,187	...	...	...	...	41	1,412
Canada and Newfoundland	275	1,823	81	333	1,181	161	3	52	...	...	531	4,440
Bahamas, British West Indies and British Guiana	21	20	45	...	...	342	...	38	...	93	...	559
Mexico, Gautemala, Nicaragua, Venezuela, Colombia and Panama	36	402	14	...	...	2,105	...	...	...	82	113	2,752
Peru and Uruguay	195	254	...	75	...	348	...	103	75	515	190	1,755
Chile	111	...	109	91	...	473	...	6	14	79	771	1,654
Brazil	698	905	541	284	273	7,932	961	46	18	7	2,570	14,235
Argentine	152	7,173	142	1,073	311	6,172	651	454	342	1,296	1,095	18,861
Egypt, Tunis and Persia	54	161	235	87	...	112	22	...	...	165	269	1,105
British West Africa and St. Helena	74	339	...	28	21	96	15	3	14	39	378	1,007
Cape of Good Hope	674	676	381	525	94	3,271	...	1,566	...	...	67	7,254
Natal	705	12,219	39	119	...	13,454	20	...	...	...	1,209	27,765
Rhodesia, Orange River Colony and Transvaal	2,134	3,389	98	757	15	1,649	...	305	66	67	159	8,639
Mauritius	23	...	...	33	...	...	5	8	...	...	15	84
China and Siam	1,669	848	158	510	142	5,237	26	503	34	99	13,970	23,196
Japan	241	2,168	250	320	556	3,718	740	341	...	3,432	391	12,157
India	958	7,475	1,916	1,084	558	17,835	1,333	1,147	172	1,321	273	34,072
Ceylon	38	21	29	33	86	220	330	231	...	59	...	1,047
Straits Settlements and Fed. Malay States...	321	526	9	167	90	676	96	28	...	211	174	2,298
Hong Kong	343	323	95	135	26	351	3	17	...	15	...	1,308
West Australia	177	132	...	144	11	200	...	12	...	...	...	676
South Australia...	490	1,737	21	177	161	1,070	430	146	...	432	...	4,664
Victoria	1,408	3,281	132	620	131	4,929	...	632	...	4,748	...	15,881
New South Wales	2,207	1,750	261	563	472	10,495	1,710	1,153	64	246	...	18,921
Queensland	60	242	39	42	...	1,279	148	...	...	37	...	1,847
Tasmania	16	...	...	...	...	270	...	...	...	...	...	286
New Zealand	977	4,227	167	560	131	1,411	160	41	...	4,615	1,784	14,073
Total, £	15,990	52,303	5,172	9,073	6,405	103,470	7,561	7,318	823	18,189	34,132	260,436

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

	£	£	£	£	£	£	£	£	£	£	£
Norway, Sweden and Denmark	...	...	9	5	...	455	...	338	...	3,843	4,650
Germany	847	14,187	2,894	24,689	2,134	18,786	863	1,652	4,062	12,199	82,313
Holland	...	8	14	3,073	5	29	...	...	51	18	3,198
Belgium	104	614	4	31	85	2,093	...	132	425	5,269	8,757
France	134	561	534	1,457	198	2,179	...	2,219	2,592	3,763	13,637
Switzerland	13	492	382	74	75	2,909	...	2	9	...	3,956
Italy	74	1,671	24	...	...	...	...	...	...	530	2,299
Austria-Hungary	25	385	38	271	...	70	...	8	472	128	1,397
United States	1,524	110	781	4,297	86	5,146	5,462	552	...	261	18,219
Total, £	2,721	18,028	4,680	33,897	2,583	31,667	6,325	4,903	7,611	26,011	136,426

Additional imports: Spain, carbons, £25; Canada, instruments, £3; New South Wales, goods, £8.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

	£	£	£	£	£	£	£	£	£	£	
Various countries, mainly as above	2,276	1,159	...	2,691	...	4,952	...	197	242	6,115	...

TOTAL EXPORTS: £260,436. TOTAL RE-EXPORTS: £17,662. TOTAL IMPORTS: £138,462.

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

TRADE STATISTICS OF CHILE.

The following figures, showing the imports of electrical and similar materials into Chile during 1907, are taken from the Annual Consular Report on the trade of Chile, just issued; figures of increases or decreases, as against the previous year, are added for purposes of comparison:—

	1906.	1907.	Increase or decrease.
Coal.—	Tons.	Tons.	Tons.
From United Kingdom ...	744,000	1,089,000	+ 345,000
„ Australia	235,000	346,000	+ 111,000
„ Germany	24,000	32,000	+ 8,000
„ Other countries ...	17,000	35,000	+ 18,000
Total ...	1,020,000	1,502,000	+ 482,000
Acids—sulphuric, nitric, &c.	Kilogs.	Kilogs.	Kilogs.
From United Kingdom ...	33,000	175,000	+ 142,000
„ Germany	196,000	553,000	+ 357,000
„ France	3,000	27,000	+ 24,000
„ Other countries ...	2,000	74,000	+ 72,000
Total ...	234,000	829,000	+ 595,000
Earthenware, crockery, &c.—			
From United Kingdom ...	952,000	1,412,000	+ 460,000
„ Germany	1,401,000	1,180,000	— 221,000
„ France	43,000	52,000	+ 9,000
„ Other countries ...	288,000	188,000	— 100,000
Total ...	2,684,000	2,832,000	+ 148,000
Porcelain.—			
From United Kingdom ...	52,000	54,000	+ 2,000
„ Germany	462,000	396,000	— 66,000
„ France	32,000	46,000	+ 14,000
„ Other countries ...	29,000	19,000	— 10,000
Total ...	575,000	515,000	— 60,000
Iron and steel wire.—			
From United Kingdom ...	828,000	1,978,000	+ 1,150,000
„ Germany	4,194,000	6,656,000	+ 2,462,000
„ Belgium	844,000	1,585,000	+ 741,000
„ U.S.A.	2,126,000	4,996,000	+ 2,870,000
„ Other countries ...	86,000	77,000	— 9,000
Total ...	8,078,000	15,292,000	+ 7,214,000
Copper and bronze wire.—			
From United Kingdom ...	28,000	75,000	+ 47,000
„ Germany	119,000	250,000	+ 131,000
„ U.S.A.	30,000	57,000	+ 27,000
„ Other countries ...	1,000	3,000	+ 2,000
Total ...	178,000	385,000	+ 207,000
Lamps of various metals for electric and paraffin lights, and mining lamps.—			
From United Kingdom ...	44,000	34,000	— 10,000
„ Germany	114,000	116,000	+ 2,000
„ U.S.A.	26,000	29,000	+ 3,000
„ Other countries ...	20,000	23,000	+ 3,000
Total ...	204,000	202,000	— 2,000
Pipes and tubes of iron for drains, &c.—			
From United Kingdom ...	18,415,000	12,913,000	— 5,502,000
„ Germany	5,635,000	4,441,000	— 1,194,000
„ Belgium	1,919,000	4,093,000	+ 2,174,000
„ U.S.A.	271,000	611,000	+ 340,000
„ Other countries ...	591,000	5,000	— 586,000
Total ...	26,831,000	22,063,000	— 4,768,000
Cranes and lifting machines.—			
From United Kingdom ...	417,000	421,000	+ 4,000
„ Belgium	21,000	—	— 21,000
„ Germany	68,000	48,000	— 20,000
„ France	1,000	2,000	+ 1,000
„ Other countries ...	2,000	11,000	+ 9,000
Total ...	509,000	482,000	— 27,000
Machines for industrial uses.—			
From United Kingdom ...	2,670,000	4,239,000	+ 1,569,000
„ Germany	2,221,000	2,649,000	+ 428,000
„ Italy	14,000	46,000	+ 32,000
„ Other countries ...	977,000	1,809,000	+ 832,000
Total ...	5,882,000	8,743,000	+ 2,861,000
Railway coaches and cars.—			
From United Kingdom ...	6,699,000	4,436,000	— 2,263,000
„ Germany	1,923,000	4,552,000	+ 2,629,000
„ Belgium	4,541,000	8,542,000	+ 4,001,000
„ U.S.A.	175,000	556,000	+ 381,000
„ France	127,000	36,000	— 91,000
Total ...	13,465,000	18,122,000	+ 4,657,000

	1906.	1907.	Increase or decrease.
Locomotives and tenders.—	Kilogs.	Kilogs.	Kilogs.
From United Kingdom ...	538,000	2,472,000	+ 1,934,000
„ Germany	4,116,000	3,983,000	— 133,000
„ U.S.A.	326,000	1,850,000	+ 1,524,000
„ Other countries ...	73,000	15,000	— 58,000
Total ...	5,053,000	8,320,000	+ 3,267,000
Electrical machinery.—			
From United Kingdom ...	546,000	1,422,000	+ 876,000
„ Germany	951,000	1,512,000	+ 561,000
„ U.S.A.	494,000	454,000	— 40,000
„ Other countries ...	22,000	44,000	+ 22,000
Total ...	2,013,000	3,432,000	+ 1,419,000
Mining machinery.—			
From United Kingdom ...	14,586,000	10,090,000	— 4,496,000
„ Germany	3,445,000	3,162,000	— 283,000
„ Belgium	16,000	247,000	+ 231,000
„ U.S.A.	253,000	389,000	+ 136,000
„ Other countries ...	—	29,000	+ 29,000
Total ...	18,300,000	13,917,000	— 4,383,000
Rubber and gutta-percha goods.—			
From United Kingdom ...	42,000	35,000	— 7,000
„ Germany	46,000	44,000	— 2,000
„ France	10,000	9,000	— 1,000
„ Other countries ...	22,000	23,000	+ 1 000
Total ...	120,000	111,000	— 9,000

Kilog. = 2 204 lb.

THE NEW GUTTA-PERCHA CO., LTD.

In our issue of February 26th, 1904, we gave some interesting particulars regarding Gutta-Gentzsch, a cable-insulating material which the New Gutta-Percha Co. had placed on the market, and which, as a substitute for vulcanised rubber and gutta-percha, had obtained considerable success on the Continent.

At that time the company's operations were restricted to the manufacture of the insulating material which was made up into cables elsewhere.

This arrangement, however, did not prove a commercially workable one, and, therefore, with a view to competing in the British cable business on favourable terms, the directors decided to extend their Greenwich factory and add the necessary machinery for manufacturing cable throughout.

These extensions were carried out in 1907, under the guidance of Mr. A. E. Garbutt, who had joined the company as general manager. Mr. Garbutt brought with him a 20 years' experience in the cable business, and it is therefore not surprising that during the last 18 months the company's output has more than quadrupled, necessitating constant additions to machinery.

As to the exact composition of Gutta-Gentzsch—or Pernax, as one quality of this insulation is named—we are naturally in the dark, but its constituents include the finest quality Para rubber, and certain wax-like materials which are chemically treated in order to produce the desired consistency.

The first stage in the manufacture of Gutta-Gentzsch is the preparation of the pure para, which, after being soaked in water for some hours, is passed through a washing mill in order to get rid of grit and dirt.

The rubber is then fed into special masticating machines, together with a proportion of the chemically-prepared material to which reference has been made, the mixture subsequently passing through mixing mills and calenders, from which it emerges in thin sheets, black in appearance and highly tenacious in character.

It is then ready for wire-insulating purposes, and is passed on to the covering machines, which are specially designed for this material.

Amongst the machines in use here, we were particularly interested in a high-speed stranding machine for small cables, which is capable of turning out 6 miles of 7/22 conductor per day. There are also in the same shop ordinary stranding machines for medium sizes, and a large one for

dealing with conductors up to 91 strands, this is also adaptable for laying up three-core cables, and for armouring with steel tapes or galvanised iron wires.

Three covering machines are provided; two of these are six-nozzle machines, driven by 16-H.P. motors, for applying the insulating material to single wires, small and medium-sized strands; the third is a large three-nozzle machine for dealing with the output of the large stranding machine previously mentioned, and is driven by a 20-H.P. motor.

These machines consist essentially of an enclosed die box, through which the conductors are drawn, and into which the insulating material is forced under pressure by feed rollers, this operation incidentally revealing the extraordinary tenacity of the insulating material even under the high temperature which results from frictional effects produced by the feed rollers.

Emerging from the die box, the covered conductors are drawn through tanks of cold water to solidify the insulation before being coiled on drums.

The cores are then carefully inspected and tested and afterwards taped or braided, according to requirements, and finally treated with preservative compound.

The taping and braiding processes are carried out in a braiding shop which contains winding frames, taping machines and 16 and 24-spindle braiders in sufficient numbers to cope with the output of the covering machines.

The latest addition to the plant is a 32-spindle heavy braiding machine, for large cables up to 3½ in. in diameter.

These wires and cables are manufactured for ordinary purposes in three qualities, viz., 2,500 and 600-megohm grades, insulated with Gutta-Gentzsch, designed for use in situations where, prior to the introduction of this material, those insulated with vulcanised india-rubber of similar grades were the only suitable ones obtainable, and a third quality insulated with Pernax intended to compete with 600-megohm class "Non-Association" V.I.R.

As these insulations are free from sulphur, and do not undergo vulcanisation, it is not necessary to use tinned wires, and taping under the braid is not needed, the braid and preservative compound affording adequate protection under ordinary conditions. However, if required, tinned wires and tape are supplied at a small extra charge.

The dielectric is of the same radial thickness as specified by the Engineering Standards Committee, but the overall diameter is rather less than in other types of wires and cables, owing to the absence of tape. This is greatly appreciated by wiring contractors, as it enables them either to use smaller tubes and casings, or to draw a greater number into a given size. Other features which appeal to users are great flexibility and the fact that Gutta-Gentzsch withstands alternations of wet and dry without deterioration, which is of the greatest importance.

For high-tension work, Gutta-Gentzsch only is employed, and the cables are made up to specification or designed to suit any special requirements.

The works are provided with a 160-H.P. Marshall engine and Lancashire boiler, although the bulk of the machinery is normally operated by electric motors supplied from the South Metropolitan Co.'s mains; other indispensable features are a completely equipped test room, and the necessary stores.

It is somewhat of a habit in this country to regard a thing as new, and, possibly, untried, for the first 10 years or so of its existence, and it is, therefore, necessary to emphasise the fact that Gutta-Gentzsch insulated wire underwent prolonged and satisfactory tests by the German Postal authorities as far back as 1899; the material was also extensively tested in this country some five or six years ago with equally good results.

However, the average man is probably inclined to regard time as the crucial test of durability, and it is therefore interesting to note that several of the leading British railways have been regular users of these wires for the past six years; indeed, a portion of the company's Greenwich works was wired with its own product six years ago, and inspection shows that this is in excellent condition.

The company is now fully equipped for a large output, and judging by its *clientèle*—including, as it does, a dozen railways, some 50 municipal authorities, the National Telephone Co., and many large works, collieries and contractors—one can scarcely doubt that this dielectric is pushing rapidly into favour, despite the strenuous competition of the older forms of insulation. We are indebted to Mr. Garbutt for facilitating our inspection of the works and kindly explaining the special processes there carried out.

NOTES ON TRADE ABROAD.

(*Continued from page* 638.)

Our Electrical Business in India; Fiction and Fact.

In a report prepared in reply to a number of requests sent to him by American manufacturers of electrical machinery for information about the chances of making sales of their goods in India, U.S. Consul-General Michael, of Calcutta, told his countrymen that the "electrical machinery made in the United States is considered by electrical engineers in India as the best made in the world, and the same is true of electrical supplies." We would modestly suggest that this is just a trifle American in the manner of its expression. The Consul's figures, which follow, do not bear the mark of authority, he does not say they are "official," and we are inclined to regard them as more or less imaginary, as we show later. Is it not a wonder that we can get anything British in at all, and yet we do! Three years ago, 1906-7, the electrical machinery and goods shipped into India, according to this report, were valued at £372,000. Of this "it is claimed that British manufacturers furnished £75,000," and "*the bulk of the balance*, £297,000, went to the United States." We are interested to know why he says *it is claimed*, and further, we should like to know exactly what he means by the "bulk of the balance." Reference to our own Tables of Electrical Imports and Exports during the period, shows that our exports from this country to India were at least £328,000, exclusive of telegraph material and of trans-shipments; if that were all it tells quite a different story. It would be worth inquiring from what official source, if any, Mr. Michael's information was derived, and also whether there is anything in the method of classification which could lead him so far astray. To complete his own version, however, before we allude to what we believe to be more trustworthy British Blue Book statistics, and whether his figures be correct or not, we quote his statement showing how his £372,000 total is made up:—"Electrical machinery and goods shipped into Bengal, £122,700; into Bombay, £53,300; into Sind, £9,500; and into Burma, £56,400; other provinces helping to make up a grand total of £372,000."

Twelve to One.

Now let us refer to the issue of the ELECTRICAL REVIEW for June 4th, 1909, page 922, in which appeared an article on the "Import Trade of India." We showed there by quoting from Government Blue Books that the electrical import figures for 1906-7 were:—

From the United Kingdom—Electrical instruments, &c., £296,612; electrical machinery, £154,265 = £450,877.

From the United States—Electrical instruments, £27,782; electrical machinery, £8,733 = £36,515. That is, the electrical imports into India from the U.S. were *one-twelfth* of those sent from the United Kingdom! The figures for the year 1907-8 are still more unfavourable to the United States, their total being only £21,897, while ours was £450,536.

Really, if these figures mean what we think they do, they do not indicate that U.S. electrical manufacturers are regarded by Indian electrical engineers as being "the best in the world." Consul Michael might be a safer guide for his American electrical countrymen if he were to quote from the ELECTRICAL REVIEW, of London, next time he desires to send them statistics in "reply to a number of letters."

In Afghanistan.

In Afghanistan there are at Kabul and Quetta gold-mining and other industries established, including a modern boot factory, a new woollen mill; electric power supply is available at Kabul, and coal has been found not far off, though it is of inferior quality.

Small Indian Installations.

A U.S. Vice-Consul at Calcutta, reporting on electrical equipments and supplies, wrote as follows :—

There seems to be an excellent opening in India for small electrical installations for furnishing light and running fans in country places, and in places away from power stations. A number of successful installations have recently been made for 25-volt lamps, one for which details are available, being arranged for 30 lights, and 8 electric fans. The battery is easily contained in an unused corner, and occupies floor space of 7 × 4½ ft. The power house containing the dynamo, which is driven by a small oil engine, is placed some distance away. The whole installation is a very compact one and is quite simple in operation. There is a large field for similar installations, and American electrical companies are urged to investigate this opening.

New Railways.

During the year 1908 there were opened in India 616 miles of new railway, bringing up the total mileage to 30,576 miles. Last March 2,992 further miles were either under construction or sanctioned. The railways had 525,583 employés, of whom 73,444 were Europeans. It is reported that the English hold on the market for rolling stock is not so great as it was. In regard to local manufacturing, the limit of the length of span of railway girders which may be purchased locally was nearly doubled recently. "Orders have been issued to three State lines for the gradual introduction of electric lighting in all first and second-class carriages." The American Consul adds :—

"Heretofore all structural iron and certain other iron and steel commodities used by the State railways, and, for the most part, other railways under Government control, were purchased in England, but the rule has been relaxed. This loosening up of the home influence must be regarded as noteworthy." Quite so, and if true, it must be seriously regarded by English manufacturers who do not nowadays expect to have things all their own way in the commercial struggle. Some extracts from the *Review of the Trade of India* appeared in the ELECTRICAL REVIEW for October 9th, 1908, and these will be found of general interest.

Electricity for India's Coal Mines.

Turning to the possibilities that lie before us in the matter of electrically equipping the coalfields of India, the U.S. Consul-General at Calcutta stated not long ago that many of the collieries would have to put in new machinery, some of them requiring complete new equipment; this need led to the organisation in Calcutta of the Coalfields Power Syndicate with £140,000 capital, with the object of providing cheap power. This company in its prospectus stated that 10 per cent. of the coal mined in India was consumed at the mines for power, which, for 1907, would be a consumption of 915,296 tons, worth $3 per ton. The company proposed to sell electric current at 1 anna (2 cents) per unit, and it also proposed to handle up-to-date colliery equipments, which would be kept in stock in order to meet any emergency. It was believed that the gross revenue would be $113,666 for sale of power, and $31,150 from rentals of colliery equipments. The prospectus, from which we quote in order to indicate the position generally, stated—

At the present time many collieries have to face an early replacement of much of their plant, and it is partly owing to this that the present demands on the syndicate for power are so large. It is only since the construction of the railways that the coalfields have been seriously worked, and although the progress for many years was slow, the development has been extremely rapid of late, as the following table of coal raised in Bengal will show :—

Year.	Persons employed.	Output in tons.	No. of companies.	Capital.
1904 ...	14,896	7,058,980	28	$6,964,366
1905 ...	33,496	7,234,103	33	7,916,152
1906 ...	36,194	8,677,820	37	8,448,517
1907 ...	39,365	9,993,348	77	15,358,000

The above table shows that the number of companies and their capital employed in coal mining increased very slowly until 1907; since then the expansion has been very rapid, but, as will be noticed from the column of output, there has not yet been time for the new companies to develop their mines, and a large part of the increased capital is therefore not yet productive. A natural result of this expansion is the shortage of labour from which the coalfields are now suffering, and which is considerably restricting the operations of fully developed mines. In fact, as shown in the table, the number of miners available has not kept pace with the output, and shows little elasticity, in spite of a greatly increased demand. The slow development of the recently opened mines is also largely due to deficient labour.

Cauvery Falls.

Another Consular report for the year 1907-8 referred to the Cauvery Falls power scheme. This was undertaken, as our readers are aware, primarily for the purpose of supplying electric power to the Kolar goldfields, but it also supplies the lighting of Bangalore. It is stated to have proved a most useful and profitable investment. The net revenue from this source during the year was $500,853, which was a big return on the capital outlay. The gold mines which have been equipped with up-to-date machinery, made possible by the electric energy supplied by the Cauvery plant, yielded during 1907-8 $8,225,540, compared with $10,344,850 in the previous year. The cause of this decrease is not satisfactorily explained, although assurance is given that the decrease is in no sense to be taken as indicating the exhaustion of the mines.

Mills need Electrifying.

It is interesting to note from a further report that there are 26 jute mills near Calcutta, 24 of which in a recent year showed profits amounting to £740,000, the highest profit for a single mill being £8,270. If what we hear be correct, there will be interesting work for our firms in mill electrification shortly.

Tata's Iron and Steel Works.

The new steel mill of the Tata Iron and Steel Co. of India, which is the first in the country, and is being put up in Bengal, at Kahmati, will be on a large scale. The site of the works is some 20 square miles, and the construction of the works and necessary residential buildings involved the employment of 4,000 men, the construction of many roads, and a 45-mile railway was constructing last year. It had been hoped that the works would be ready to manufacture finished products by the end of December, 1910, but we are not sure whether that is likely to be accomplished. The electrical installation work, as was stated in our pages a few weeks ago (ELEC. REV., September 3rd), has been placed with Lahmeyer Electrical Co. The Tata Co. is partly owned by Americans, and from a U.S. report we gather that the engineer in charge of this vast enterprise, as well as his first assistant, are Americans, who have had practical experience in mill work near Pittsburg, U.S.A. The Tata Co. left the selection of the works equipment in their hands, also the selection of works officials and staff, and an American Consul may therefore feel justified in adding, "This being true large orders have been, and will probably be, placed for modern mill machinery in the United States," for that is the way things often do eventuate. The placing of the electrical installation with a Continental firm, however, is an exception, the reason for which has not reached us.

Burma.

Consul E. C. Wakefield, of Rangoon, reporting on the opening for machinery, says that when the tide turns business is expected to resume normal conditions. Here we may remark that the latest news respecting Indian trade is to the effect that there are satisfactory signs of expansion, and the season's crops promise to be above the average. "This province is very rich in natural resources and should prove a good market for standard American machinery of various kinds, including machinery for sawmilling, mining, smelting, oil drilling and refining, rice milling, agriculture and for all other industries which are sure to be established. The future of Burma is very promising, and the next few years should witness a great change in methods and results. Cheap labour has been the principal handicap in introducing modern machinery. Wages are, however, slowly but steadily advancing to a point that will ensure the employment of machinery to perform much of the work now done by manual labour."

Various Points.

Consul Wakefield in another report condemns American packing of goods as compared to English and German, and he urges that boxes containing light goods should be firmly nailed with iron straps round both ends of each and every box, large or small. He mentions cases or packages having been opened in transit and part of the consignment abstracted. "These occurrences are not infrequent." "The consignee makes claim on the shipper for such losses, the claim is seldom allowed, and possibly a good customer is

lost." "A bureau in Bombay and Calcutta for the exclusive exploitation and sale of American goods would be useful, as has been suggested at various times. Thus far, however, there has been no concerted action along this line. A few industrial firms who have acted upon the suggestion are reaping satisfactory returns from their ventures, and others might do likewise."

North-Western India.

In recent years Karachi, in North-Western India, has become of increased importance as an importing and trading centre. American Consul Wallace Bond recently told his countrymen that nearly all the large importers at Karachi are really branches of English and German firms, established there for the sole purpose of building up trade with their respective countries. Practically the only importing firms with headquarters in Karachi are native concerns—Parsee or Indian. It must be remembered by any English electrical firms who desire to open up connection there, that representatives ought to be sent out to study the customs and needs; they must also bear in mind that caste and peculiar customs practically constitute the law of the land, while religious prejudices and scruples enter largely into business; for instance, no Mohammedan will sell intoxicating liquors, lard, bacon, ham, &c., while a Parsee may do so—these are not electrical goods, though it is said that some of them have been known to enter into electrical relationships at home at Christmas time (that was before we had a N.E.M.A. to send out circulars!). We mention them purely as an illustration of the necessity of remembering a foreigner's peculiar susceptibilities and idiosyncracies if you want to make him your client. The foreigner is not alone in having his own peculiar views and predilections. He may be very entertaining, even from some points of view ludicrous; his religion may be the most heathenish thing among all beliefs, that is not our concern in this connection. It is his custom that we want, and we want him to be a satisfied consumer, so that we may retain his electrical custom for the future. He must, therefore, have the thing he needs, not what we may prefer to sell him because we already make it or have it in stock. In the year 1907-8 practically 80 per cent. of the miscellaneous machinery shipped into Karachi went from Great Britain, but America is being urged to "watch this spot," because north-western India is considered to present "a most attractive outlook as a future market for American machinery, particularly for such articles as gasoline engines, small pumps, windmills, and agricultural implements." It is not stated that our trans-Atlantic friends would have particularly encouraging results immediately, but they are being advised to commence "an industrial campaign in Karachi district as a proper and necessary preliminary for building up a great future trade." As we showed several weeks ago American electrical manufacturers have succeeded in getting important electrical plants introduced in certain parts of India during the past 10 years. A number of leading British electrical firms are alert up and down India, doing a fairly good business, but with the more settled state of affairs which we all hope for out there, there should be greatly increased opportunities. We must not let it be imagined that there is any body of manufacturers in the world better capable of catering for the electrical needs of the Indian market than are firms in this country. The connection that we have we must endeavour to hold against all comers, and in the very large new undertakings that are bound to be required before long, as well as in the innumerable private electrical installations that are continually being called for, we must be aggressively to the fore.

Rangoon Ways.

U.S. Consul Wakefield, of Rangoon, in an entertaining report on the manner in which trade is conducted in Burma, described the bazaars and the system on which they are run for the great bulk of the retail trade.

Every town and village has its bazaar section or sections, and, considering the relative size of average transactions, the amount of trade transacted is surprisingly large.

The stocks in view are not very imposing, although it is really surprising how much some traders keep, considering the small limits in which they carry on business.

Some carry reserve stocks at their homes or in godowns, while others buy, from importing agents and dealers in local supplies, quantities sufficient to meet immediate requirements. The importing agents are not usually confined to any one particular line, but handle almost anything which finds a profitable market. It is this peculiarity in the Rangoon trade which makes it difficult to list importers in particular lines of trade.

The bazaar trade is very large and constantly growing in volume as the city increases in population.

To secure a much larger proportion of this trade for American products, it is only necessary to give the same attention to details as is given by other exporting nations. American trade suffers because of inaccessibility of stocks, length of time required for delivery, practically cash-payment requirements, and improper packing. The latter, however, is being improved, and the others would largely disappear if a sales depôt or commission house were established at some point between Bombay and Singapore.

Some Indian Installations.

What is being done in India by the Calcutta Electric Supply Corporation, Ltd., and the Calcutta Tramways Co., Ltd., by the Madras Electric Tramways Co., Ltd., the Bombay Electric Light and Tramways Co., Ltd., the Oriental Telephone and Electric Co., Ltd., the Colombo Electric Light and Tramways Co., the Indian Electric Supply and Traction Co., Ltd., the Burma Electric Tramways and Lighting Co., Ltd., the Delhi Electric Tramways and Lighting Co., Ltd., the Rangoon Electric Tramway and Supply Co., Ltd., and some other English companies concerned with the supply of electric light and power and the provision of traction facilities, our readers are already familiar with. These, as they are continually developing, must be in need of extensions of plant and mains, which British manufacturers are in a position to supply. There are also (as reference to the *Universal Electrical Directory*, Colonial and General Section, will show) electricity works, either operating or constructing, at Allahabad, Bangalore Government scheme, Barrackpore, Bikanir State, Lahore, Decca, Darjeeling, Agra, Kolar mines, Lashgar, Mogok, Mussoorie, Srinagar, Pondicherry, and so on. Some of them are municipally owned, others are the property of private parties, but all of them are certain customers for the future, for where was there an electricity works put down which remained unextended for long at a time, especially where it "cut new ground," and where were there ever electrical consumers, whether for light or power, who were not wanting something more? A consumer gained anywhere is generally to be regarded as a permanent purchaser from the electrical industry. That is what we say at home, and it applies quite as appropriately to the Indian user of electric lights, fans, cooking apparatus and everything else used in the modern installation. The Jhelum water power utilisation scheme for supplying electricity to the silk factories at Srinagar we fully described in the ELECTRICAL REVIEW of March 5th and 12th, 1909. It is hoped that early in 1911 some of the plant will be ready for operating at the station of the Simla hydro-electric scheme, 14 miles from Simla. Last year, in connection with the proposed electrification of the Nilgiri Mountain railway, it was proposed to light Ootacamund, Coonoor, Wellington and Ooty. Just now, as a notice on another page shows, the city authorities of Lucknow are inviting proposals for electricity supply.

(*To be continued.*)

THE LEBLANC CONDENSER.

DESCRIBING this comparatively new form of combined air-pump-condenser as made by the Westinghouse Co., *Le Génie Civil* premises that a jet condenser is preferable to a surface condenser for certain reasons, such, for example, as the difficulty in thoroughly removing oil from condensed steam for use as boiler feed-water.

The new system described is that of M. Maurice Leblanc of the Westinghouse Co. The condenser contains no valves or clacks. It makes use of two centrifugal pumps; one is a water pump to supply condensation water, and the other a pump to remove water from the condenser after it has done its work. The supply pump is the air pump.

It is known that in a centrifugal pump the diameter of the rotating part for a given angular velocity is proportionate to the square root of the height of delivery.

In order to standardise manufacture the whole apparatus is constructed in series, with the water pump dimensioned to maximum diameter, or for a height of 10 metres above the pump axis. If a less height will serve, the pump blades are turned down to the proper diameter.

The air pump is quite novel. Fig. 1 (p. 716), a vertical section, shows its arrangement. Air enters at A. There is a reversed turbine T, which is motor-driven, and water is fed to a part of the circumference from an inner chamber i. The flat jets of water extend

across the passage A, and have a downward movement as of so many water pistons. These act somewhat on the principle of the mercury air-pump or sprengel. If, for example, there is a pressure difference of six units above and below the water pistons, and there are six water pistons at one time in the passage, then there will be about one unit of pressure difference at each piston.

In fig. 2 *a* is the injection chamber of the condenser, *c* the condensation cone, and *g* the injection jets from the water passages *f*. Air

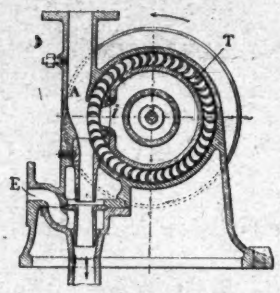


FIG. 1.—SECTION OF AIR PUMP.

is drawn away by way of the outer case *b* to the passage A of fig. 1. At *e* is a valve for the purpose of destroying the vacuum at will. The turbine is seen at *i*, *j* is the air-pump body, *k* the water chamber, and *l* the plate disk carrying the wings of the air pump.

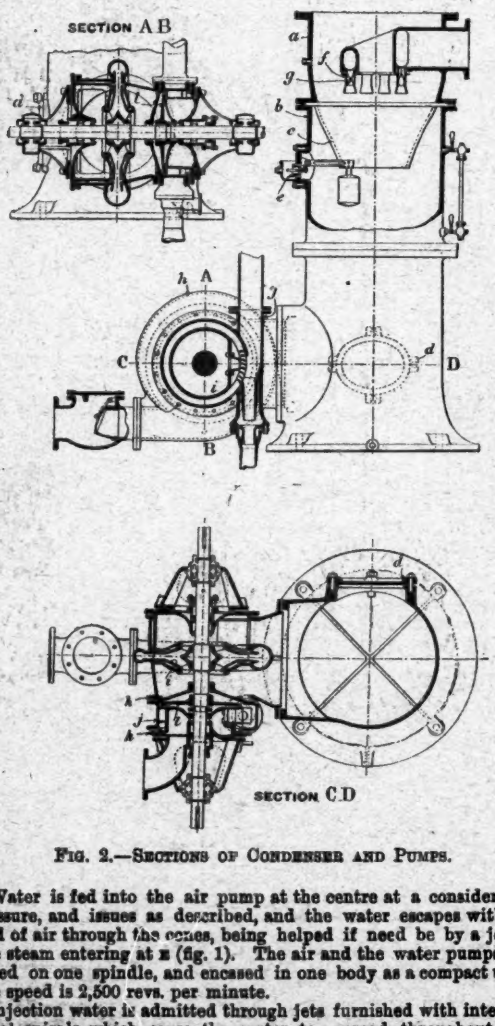


FIG. 2.—SECTIONS OF CONDENSER AND PUMPS.

Water is fed into the air pump at the centre at a considerable pressure, and issues as described, and the water escapes with its load of air through the cones, being helped if need be by a jet of live steam entering at B (fig. 1). The air and the water pumps are keyed on one spindle, and encased in one body as a compact unit. The speed is 2,500 revs. per minute.

Injection water is admitted through jets furnished with internal metal spirals which cause the water to spread throughout the condenser in the form of spray. A first compression of the air is given in the cone *c*. The float below the cone breaks the vacuum if the water rises too high.

An ordinary water jet gives the following results:—

Pressure of aspired air, 60 mm. of mercury.
Water temperature, 9·5° C.

Initial water pressure	0·5	1·0	2·0	3·0	4·0 atmospheres.
Litres of air entrained per litre of water	0·2	0·4	0·75	1·00	1·35

If the centrifugal pump has an efficiency of 85 per cent., the cubic metres of air entrained will be:—

Water pressure in atmospheres ...	0·5	1·0	2·0	3·0	4·0
Cubic metres of air per hour entrained per horse-power	9·2	9·2	8·62	7·67	7·78

In a Leblanc pump of about 40 H.P. working with convergent air ajutages perfectly calibrated to an efficiency of unity, the following results were obtained with a speed of 480 R.P.M., and a water temperature of 8·5°:—

Water in litres per second.	Horse-power absorbed.	Diameter of air inlet mm.	Weight of air per second. Grammes.	Absolute pressure in the pump in mm. of mercury.	Volume of air aspirated. Litres per litre of water.	Volume of air aspirated. Cubic metres per H.P.-hour.
16·0	22·0	0	0·00	9	0 0	0 0
27·0	28·0	2	0 75	11	6·5	23·5
35·5	36·5	4	2·87	18	5·0	17 6
34·0	36·5	6	6·16	24	4·4	15 0

These results justify the development made by this condenser especially in its application to turbines.

The vacuum obtained is high, and is limited only by the temperature of the water fed to the cones.

There are no waste spaces such as prevent an ordinary air pump from securing equal results, for since such pumps draw moist air, they work as though they really had considerable lost volume.

The Leblanc condenser is claimed to be excellent for central plants which do not give vacua of above 85 to 90 per cent. In a

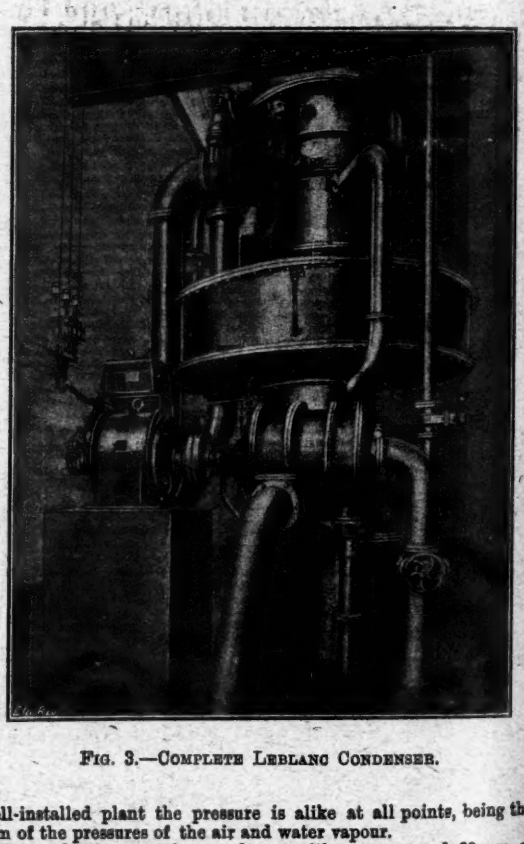


FIG. 3.—COMPLETE LEBLANC CONDENSER.

well-installed plant the pressure is alike at all points, being the sum of the pressures of the air and water vapour.

Thus take the case of a condenser with a pressure of 60 mm. of mercury, condensing water at 15° C. initial temperature being supplied in such proportion that it becomes heated to 34° C.

If the pump is a piston pump extracting air and water, it takes the air at a pressure of 60 mm.; water vapour at 34° has a pressure of 39·6 mm.—or say, 20·4 mm. less. The pump should engender A cubic metres if one counts on a volumetric output equal to unity. But if the pump is of Leblanc type, it takes air at 60 mm. diminished only by the pressure of water vapour at 15·5°, or 12·7 mm.—*i.e.*, at 47·3 mm., and should engender a volume $A \frac{20·4}{47·3} = 0·43$ A only, or less than half that demanded in a piston pump.

At the coal mines of Anzin, where the system has been at work nearly a year, there is a winding engine of 850 H.P. with two cylinders of 800 × 1,500 mm. at 45 R.P.M., a compressor of 150 H.P., with two cylinders of 500 × 1,200 mm., a Rateau fan with a Baulte-Labordière motor of 340 × 590 × 360 of 150 H.P. at 280 R.P.M., and an electrical generator of 90 H.P. at 70 R.P.M. The hourly steam consumption is 10,000 kg., but owing to intermittent working it fluctuates between 3,600 and 21,600 kg., this latter rate lasting for 25 seconds per draw. There are 25 draws per hour.

There is a Balcke water tower with chimney and water delivery 5 metres above the pump axis of the condenser. The Leblanc condenser has a capacity of 16,200 kg. of steam per hour. It is worked by a three-phase asynchronous motor of 60 H.P. at 480 R.P.M. The water return pump delivers directly to the cooling tower. With an injection of 10° C. and a barometer of 770 mm., the vacuum realised varied from 89·5 to 100·7 of the theoretical vacuum due to the temperature of the outflow water, the highest percentage of vacuum accompanying the hottest outlet water, and being due therefore to the effect on the air of the inlet water temperature. The air pump is fed with cold water, which becomes the make-up water of the cooling tower.

After six months' work a test was made with injection water at 20° C. and a barometer of 757 mm., and the percentage vacuum was from 95·8 to 98·0 per cent.

This air pump, therefore, appears to be particularly efficient, and of special value for turbine work.

PROCEEDINGS OF INSTITUTIONS.

Steam Turbines.

By Gerald Stoney, M.Inst.C.E.

(*Abstract of* Cantor Lectures *delivered before the* Society of Arts, *March and April*, 1909.)

(*Concluded from page* 678.)

In the last lecture some account is given of the greatest development in the application of the steam turbine, that is, to the propulsion of ships.

The large and increasing amount of horse-power, and the greater size and speed of the modern engines tend towards some form which shall be light, capable of perfect balancing, and economical in steam. The marine engine of the piston type does not fulfil these requirements. In January, 1894, a pioneer syndicate was formed to explore the application of the steam turbine to marine propulsion. After three years' hard work and many failures the *Turbinia* was completed, and in her the problem of adapting the turbine to work a screw propeller was worked out, and, like almost everything else in engineering, resulted in a compromise.

In the first lecture it was shown that for any given amount of expansion and a given velocity ratio, a certain spindle volume was necessary for good economy. By dividing up the turbine into three parts, each had only one-third of the total volume, and at the same time the blades were three times as high as if there were three separate turbines, each with drums of the same diameters as the divided ones. Also, since the expansion in each is moderate, there is no need to step the drums, and thus they are cylinders of one diameter only, very short and stiff, and enabling fine clearances to be used.

The total result was that the weight was probably about one-third and the leakage one-quarter of what there would have been with three separate turbines, each having the full expansion carried out in it, and it was this dividing up of the turbines that more than anything else made the *Turbinia* the success she was. A separate stern turbine was fitted on the centre shaft for going astern. After the *Turbinia*, the *Viper* and *Cobra*, torpedo-boat destroyers, followed, but the next great step was the introduction of the turbine into the mercantile marine, when the *King Edward* was built in 1902 at Dumbarton, the engines being made by the Parsons Marine Steam Turbine Co., of Wallsend.

The success of the *King Edward* was the starting point for the success of the turbine in the mercantile marine for ships above 18 knots. At sea as well as on land one of the most important questions is coal consumption, and it was found by Messrs. Denny that this was some 20 per cent. less than in the case of similar vessels with reciprocating engines; also the cost of oil, which generally amounts to something like 5 per cent. of the coal bill, was reduced to well under 1 per cent., and at the same time the upkeep of the machinery was found to be very small, and it was most reliable. Vibration was also less, and the necessary engine-room staff much reduced.

In 1906 the Admiralty decided to fit turbines in all new fighting ships, and the Commission appointed to consider the question of the 25-knot Atlantic liners to be built by the Cunard Co. decided on turbines instead of reciprocating engines for these great vessels.

The Admiralty went up from the 15,000 H.P. of the *Amethyst* to the 23,000 H.P. of the *Dreadnought* and the 41,000 H.P. of the *Indomitable*.

The Cunard Commission went up from the 8,000 H.P. of the cross-channel boat *Queen* to the 70,000 H.P. of the *Mauretania* and *Lusitania* in a single step, a thing requiring the greatest courage and confidence on the part of the Cunard Co. How successful these ships have been has been proved by the recent trip of the *Mauretania*, in which she crossed the Atlantic in less than 4½ days at an average speed of 26 knots.

In these Cunarders each low-pressure turbine weighs about 300 tons, is some 50 ft. in length and 17 ft. 6 in. in diameter; in the *Queen* they were only 25 tons weight, 20 ft. long, and 6 ft. in diameter.

In these vessels, on account of their great size, it was decided to have four shafts, both to reduce the size of the turbines and to give increased reliability in case of accident. Thus each side, port and starboard, is complete in itself, having a high pressure and a low pressure turbine on separate shafts.

In the case of warships also, especially of large size, a similar arrangement of four shafts is adopted, and such an arrangement has the great advantage that each set of engines is completely independent of the other, and thus, although one may be disabled by gun fire or torpedo, the other is unaffected, a condition which it is not possible to arrange with three shafts.

During the past 12 years there has been a distinct improvement in the steam consumption of turbine ships. In 1897 the *Turbinia* consumed 16 lb. per shaft H.P.; in 1907 the *Mauretania* consumed 11½ lb. The last figure represents about 69 per cent. of the energy available in the steam, according to Rankine's Cycle.

Part of the improvement is due to increased size, which as a rule, under similar conditions, gives more economy, because of the reduction in the ratio of clearance to length of blade, and consequent reduction of leakage. Part also has been due to improvements in manufacture and design, especially in the direction of better vacua. Increase in the steam pressure above, say, 120 to 150 lb. at the turbines, as a rule, improves the efficiency of the turbine only a little, and adds to the weight not only of the turbine, but also the boilers, steam pipes, &c. More can be done at the lower end of the range of expansion, that is, by improving the vacuum.

The application of the steam turbine to the propulsion of slow-speed ships, that is, ships of below 15 to 18 knots, has up to the present been difficult owing to the low speed of revolution of the screws making the turbines large and heavy, as well as not economical. This difficulty has now been got over by the use of an arrangement patented by Mr. Parsons some years ago, viz., the combination of reciprocating engines and exhaust turbines, similar to what was described before for land work. Here each utilises the part of the expansion for which it is best suited—the reciprocating engine for the high pressure part of the range, and the turbine for the low pressure where the volume of steam is large. The reciprocating engine, as explained before, is not economical for low pressures and large volumes, and the steam turbine, especially when the rate of revolution is small, is large, heavy, and uneconomical for high pressures and small volumes; but the turbine for low pressures, even at low revolutions, is an exceedingly economical heat engine. Thus the combination is more economical than either alone.

The first ship to be fitted thus was the *Otaki*, which at 13 knots sea speed required only 5,000 H.P. With 200 lb. pressure and without superheaters being fitted, the very low consumption of 12·3 lb. steam per shaft horse-power for all purposes was attained on trials, and better results are expected after more experience is gained in the working of the ship. But even this trial consumption is better than that which could be attained by the use of either reciprocating engines or turbines alone.

It is interesting to note that in the early days of the screw propeller the great difficulty was to make the engines run fast enough for the screw, and spur gearing was adopted in many cases in the first half of the last century. Now the difficulty is to make the turbine run slow enough for the screw, and once more gearing is being considered, so as to make the turbine adaptable for use in slow-speed steamers, which constitute by far the greater part of the shipping of the world.

The electrical gearing is especially promising, one or more turbines with dynamos or alternators, practically identical with those used on land, being employed to drive one or more motors on the screw shafts at reduced speeds of revolution. Again, in the combination system of reciprocating engine and turbine, the exhaust turbine may be a high speed one, driving a motor on the shaft of the reciprocating engine instead of a screw on its own shaft.

Such questions are now receiving much attention, and may result in all the steamships of the world being wholly or partly turbine-driven, instead of only those vessels of comparatively high speed.

At the present date there are about 120 vessels actually on service fitted with turbines, representing about 1,250,000 H.P., and these comprise practically all the high-speed ships which have been recently built. Some 70 more are under construction, representing another 1,000,000 H.P., or a total of 2,250,000 H.P., and the curve of progress as yet shows no sign of saturation.

It has taken 200 years to bring the reciprocating engine to its present high state of efficiency; the steam turbine in a practical form is only 25 years old, and already has in many instances proved its superiority to its older rival.

The Physiological Effects of Radiation.*

On September 28th, Dr. C. P. Steinmetz delivered a lecture before the Illuminating Engineering Society on this subject. He said the statement had frequently been made that short wave lengths were harmful to the eyes, and it had often been said that lamps which produced short wave lengths necessarily had an injurious effect on them. The fact of the matter was that daylight contained proportionately even more ultra-violet light than any of the light from the common artificial sources. Beyond any doubt, harm had been produced as a result of the introduction of artificial lighting, but such harm was attributable to the fact that humanity now made use of the eyes for more hours per day than formerly, rather than to any injurious effect produced by artificial light itself.

The harmful effects due to radiation which did not fall within the visible spectrum might be classified as indirect, direct and specific. One of the indirect effects was that connected with the attempt of the eye to match colours when the light was of an improper tint.

* Abstract from the *Electrical World*.

In such a case there was an over-straining of the eye which attempts to overcome the deficiency by adjusting itself to the abnormal conditions. As a direct effect, what might be called a "power blow" upon the eye, was produced when energy reached the eye at a rate considerably greater than that for which the eye was momentarily adjusted. The mechanism of the eye was so arranged that the pupil contracted in order to reduce the light reaching the retina to the proper value. When radiations suddenly impinged upon the eye at an excessive rate, the mechanism was unable to act instantaneously, and the eye received a damaging blow; such a blow was caused by the light from an electric arc in the case of a short-circuit. Exposure to an explosion of this nature produced temporary blindness, but the recovery of the eye was relatively quite rapid. The blow could be said to be due almost exclusively to the infra-red radiation.

High-frequency ultra-violet light in considerable quantity was very harmful. The harm produced by such radiations became apparent at a very slow rate, and the recovery therefrom was extraordinarily gradual. For example, there might be cited the case of an investigator who subjected his eyes to the unshielded mercury vapour arc; the recovery from the injury to his eyes required practically eight years. The symptoms of trouble from high-frequency radiations were headaches and a blurring of the vision.

The radiations from the commercial form of incandescent electric lamps contained practically no ultra-violet light. The common carbon arc lamp gave forth a limited amount of ultra-violet radiation. Arc lamps of the flaming and luminous types gave a considerable amount of ultra-violet light. Such lamps must be provided with enclosing globes. For this purpose even clear glass was quite effective, because it was opaque to ultra-violet light. The common low-temperature mercury-vapour lamp produced ultra-violet light in considerable quantity, but was harmless on account of the fact that the arc was surrounded by glass. The high-temperature mercury-vapour lamp was provided with a quartz tube, through which the ultra-violet light, if produced, would pass readily; however, the high-temperature lamp gave forth almost no ultra-violet radiations. An effective method of detecting the presence of ultra-violet light was by noting the odour of ozone, which was either caused by, or produced simultaneously with, such light.

Among the advantageous characteristics of radiation not found within the visible spectrum might be mentioned the beneficial effect upon plant life, and the destructive effect upon certain germs.

Factory Lighting.

At the same Convention of the Illuminating Engineering Society, the disadvantageous features of localised and highly concentrated illumination, as commonly used in many factories, were discussed by Mr. L. B. Marks. In installations of this kind the illumination produced by each lamp is confined to a very small zone which is brilliantly illuminated, while contiguous parts of the working space, where good light is needed, are in comparative darkness. The actual intensity of illumination directly underneath the lamps is in most cases several times as much as is desirable to secure the best vision.

With the localised system of illumination as installed in factories, there is a maximum of direct reflection of light from the working parts of the machines. The direct reflected light does not increase the ability of the operator to see the object, but, on the contrary, decreases his visual acuity and necessitates the use of a far greater amount of localised light than would be needed if there were no direct reflection.

In a system of localised illumination, such as is employed in factories, it is necessary to readjust frequently the height and position of the lamps to suit the requirements of the work. There appears to be a natural tendency on the part of the operator to place his lamp as close as possible to the field which is to be illuminated. The operator may be content for a while with the localised lamp 2 ft., or even 3 ft., above his work, but experience shows that when the matter of adjustment is left to him, he will, as a rule, ultimately lower the lamp to a position as close to the work as it is possible to locate it without actual physical interference with the operation of the machine or the performance of the work.

The frequent handling of the lamps by the operators to adjust the height and position of the lighting units results in soiling the lamps and reflectors. It is not unusual, in most of the departments, to find finger marks on the glass bulbs and on the reflecting surface of the shades, which latter are in many instances so smutted from handling that they are practically worthless as reflectors. The proximity of the lamps and reflectors to the machines accounts in some cases for the rapid accumulation of gritty and oily material on the former. This is especially true of the grinding, the buffing and the automatic-screw machine departments, in which the lamps and reflectors are begrimed and oil-spattered. Measurements have shown that almost double the amount of light was given on the working plane when a clean reflector was substituted for a deteriorated reflector.

The handling of the lamps by the operators and the disposition of the latter to place the lamps as close as possible to the work sometimes lead the operators to bend the reflectors and force them into some convenient part of the machine close to the work. In some instances where it is impossible to lodge the lamp in a convenient part of the machine because of the large size of the reflector, the reflector is removed by the operator and the bare lamp used.

The frequent adjustments and readjustments of the lamps unnecessarily occupy the time of the operator and to some extent distract his attention from his work. The multiplicity of dangling wires from the drop lamps presents an unsightly appearance. Moreover, those wires are apt to be in the way of moving parts of the machinery, &c.

In some cases the eyes of the operator are very close to the reflector, and are affected by the heat of the lamp. Objectionable shadows are cast by the reflectors, lamp supports, drop cords and hangers. The shops present a gloomy appearance at night. Even when all the local lamps are in operation, the intensity of the general illumination on the working plane in locations outside of the restricted field illuminated by the drop lamps is at best only about 0·25 foot-candle, being less than 0·15 foot-candle in most of the departments, and in some less than 0·03 foot-candle. The extremely low degree of general illumination in the shops makes it difficult, if not impossible, for the foreman to exercise the same character of supervision at night as he does in the daytime, and makes it more difficult to guard against factory accidents.

With the present system of localised illumination in shops, advantage cannot be taken at night of the reflecting and diffusing value of the walls and ceilings, whereas in the daytime the walls and ceilings are used to great advantage in reflecting and diffusing natural illumination.

A remedy for the objectionable features of concentrated factory lighting lies in the use of a suitable degree of general illumination and moderate intensity of localised lighting.

The Electric Driving of Textile Factories.

At a meeting of the Bradford Engineering Society, on November 28th, 1907, a Committee of Inquiry, including representatives of mechanical and electrical engineering firms, the Bradford Corporation Electricity Department, textile firms, and the textile department of the Bradford Techical College, was formed to inquire into this subject.

A programme limiting the scope of the inquiry was drawn up, and it was decided, in the first place, to carry out certain experiments to determine the actual cyclical variation occurring in prime movers and electric motors and in shafting and machinery driven by them.

An exhaustive series of trials was carried out by Prof. Charnock and Mr. Barker at Dock Ing Mills, Batley, by kind permission of Messrs. Brigg & Sons, the proprietors. This mill was selected as an example in which the plan of the buildings necessitated power being taken off in various directions by means of spur and bevel gear, belt and rope driving, with long lengths of shafting intervening in some cases. The machinery driven included mules, cards, drawing and looms. From a report prepared by Mr. Barker, it was found that even under such circumstances, the amount of cyclical variation was not nearly so great as had been anticipated. Further tests were made at the Leigh Mills Co., Ltd., Upper Mills, Stanningley, with worsted-drawing machinery driven by an induction motor, using current from the Yorkshire Electric Power Co.'s supply, and also on spinning machinery driven by shafting from a compound tandem Corliss engine. Various other tests were made at works in the city, and Mr. W. B. Woodhouse kindly arranged some experiments to demonstrate the speed variation due to slip in three-phase motors under varying load. The committee also visited the Thor Mill, Whitworth, near Rochdale, on the invitation of Messrs. Siemens Bros. Dynamo Works, Ltd., who supplied the equipment for electric driving. The point submitted was that, with this arrangement, the increase in steadiness of turning was such as to lead to increased output and better quality, commanding a higher price on the market. Of this no actual evidence could be supplied, and the committee have been unable to obtain any proof whatever based on actual experience.

The committee, after very carefully considering the above results, and after a thorough discussion of all the information before them, arrived at the following conclusions:—

1. That in good installations there is practically no difference in cyclical variation between mechanical and electrical transmission when measured at the end nearest the main drive.

2. That any initial cyclical variation which may exist at the driving end of the above shaft is liable to be increased if transmitted through long shafts. This can, however, in many cases, be controlled by known methods of destroying synchronous vibrations.

3. That so far as any irregularity is concerned (excluding breakdowns), electrical transmission will maintain its condition better than mechanical transmission.

4. That in modern textile, combing, spinning, and weaving factories, where those factories are of ordinary dimensions, and where the power is generated on site, power is conveyed with less loss by mechanical than by electrical transmission; but where the plan of the buildings is irregular, involving awkward angles of drives or irregular arrangement of machinery, the saving in power by electrical transmission begins to appear. The Committee find it difficult to arrive at a definite decision as to the exact point where the friction due to mechanical transmission is excessive, owing to the very varied conditions which obtain, but make the following suggestions:—

5. That the friction loss with mechanical transmission is excessive if over 30 per cent. By "friction loss" is meant the proportion which the collective friction of the engine drives, and shafting with the belts on the loose pulleys of the driven machines, bear to the total horse-power when the whole load is on the engine.

6. That electrical transmission is likely to be most efficient—

(*a*) Where there are long lengths of shaft from which power is not taken off at intermediate points.

(*b*) Where machinery is distributed and requires starting and stopping frequently during the day.

(*c*) Where machines require to run at various speeds and have those speeds altered during motion.

(*d*) Where there are excessive lengths of shafting, making it desirable to separate these into two or more lengths.

The question as to the adoption of electrical or mechanical driving is largely one of cost, which can only be decided by careful investigation of each individual case. By adopting electric driving, the following advantages can be obtained, whether the power be generated on site or taken from an outside source of supply:—

1. Ease of checking daily the power required for running individual machines and departments, and of detecting any faults or deterioration of the plant. In the case of mechanical driving, this may be done by employing some form of power meter.

2. Ability to run only a portion of the plant—as, for instance, on overtime—without serious loss in transmission. With mechanical transmission, the same object may be attained by the judicious application of clutches or similar mechanical devices.

3. Reduction in the number of belts, shafts, gears, &c., with consequent improvement in lighting and cleanliness when individual driving is adopted.

4. Ease of regulating the speed and of introducing periodical speed variations in certain machinery, if individual driving be adopted.

5. Ease of utilising the available space to the best advantage and of extending into adjacent buildings at any time, irrespective of the layout of the same.

6. Saving in the cost of the engine house and its foundations, the latter made possible by the adoption of a high-speed generating set. Care must be taken that the possible extra cost of other portions of the plant or buildings, or reservoirs, does not more than balance any saving in the direction indicated.

The following further advantages may be obtained if an outside source of supply is available:—

1. A reduction in the first cost of the installation and buildings due to the absence of power generating plant. This, in conjunction with the corresponding saving in floor space, may be utilised for the installation of productive machinery.

2. Freedom to run only parts of the plant, and to work overtime without any increase in the cost per brake-horse-power of the power used.

3. Unlimited supply of power available.

4. Less liability of total stoppage, due to the standing plant of the supply authority, as compared with private generating plant.

This report is not to be regarded as complete or final, but is presented to the Society as an indication of the work already accomplished by the Committee.

G. F. Charnock, *Chairman.*

DOMESTIC ELECTRICITY.

By MAUD.

After a somewhat chequered and interesting experience with regard to electric lighting and the simpler forms of electric heating and cooking, I decided to try an electric oven. The majority of housewives shrink from this mode of cooking chiefly on account of cost, but the information which I have at hand, based on my own experience, contradicts this commonly asserted notion, that electricity is very dear for cooking purposes.

Let us take first the simplest and most commonplace method of cooking—that of a coal fire—and suppose we have to deal with an average-sized cooking range; this, I find, costs, on an average, to cook a dinner consisting of a joint (about 5 lb.), pudding, pastry and vegetables, about 2½d. in coal, allowing for coal at 16s. per ton; you may say that for this price you also have a constant supply of hot water, but this is not always the case, as usually the boiler damper must be closed to allow sufficient draught to heat up the oven, and therefore the cost of heating water for the house is an entirely separate charge.

Passing on to gas cooking, which is undoubtedly the most popular method of cooking at the present time, it is found that this costs for the same dinner 3d.; this price does not include the time and gas taken to heat up the oven or the greater time taken to rid the oven of the objectionable smells (if the latter precaution is not taken the smell permeates the food).

Thirdly, we come to electric cooking, as regards the cost of which the majority have such hazy notions. This costs for the same dinner 2½d., with electricity at 1d. per unit. On the top of the oven stands a boiler for vegetables, &c., all the rest of the cooking being done in the oven. This oven is controlled by a switch, which allows for three heats: the first of these is low, costing a third of 1d. per hour; the second, which is medium, costs a little under three-quarters of 1d. per hour; the third is high heat, with all the heaters in use, the cost being a little less than 1½d. per hour, with electricity, as previously mentioned, at 1d. per unit.

The electric oven takes a very short time to heat up to its maximum temperature, and when so heated can be easily regulated by the aforementioned switches, with the result that meat can be cooked to perfection, and cakes and pastry browned, in a way almost impossible with the ordinary cooking range. It will also be found that the lighter forms of confectionery can be cooked after the current has been switched off, by means of the heat contained in the oven.

As will be seen by this article, I am enthusiastically in favour of electric cooking, though I must confess that previous to my experience with this most useful form of cooking, I was rather sceptical both as regards the cost of electricity for cooking purposes, and as regards the reliability of cooking utensils, but I have now nothing but praise for the same, after having given this oven a good and fair trial.

It would probably be interesting to many readers to know whether electric cooking is as satisfactory as cooking by coal or gas. My experience has taught me that electric cooking is far ahead of either of these, its competitors, for cooking purposes, owing to the very even temperature obtained, which, as every lady knows, is essential to produce satisfactory results. The only fault I have to find is the entire absence of a ventilator on the oven; the want of this ventilator means that there is always, when cooking, a fair amount of steam in the oven, and this tends to take up some of the heat which should be given to the contents of the oven. I am sure this small thing has only to be appreciated by the makers to be remedied.

On the score of cleanliness the oven has no equal; all that is required after cooking is wiping out with a damp flannel, as there is no possibility of dust and dirt as with fires, and absolutely no smell is left in the oven after cooking is done. When the oven is switched on, that is all that is necessary for the heating of it, and there is not the continual poking and building up as with the coal fire, which must be done to keep the oven to a maximum even heat, the result of all this poking being that the heat of the ordinary oven is continually varying.

From the numerous questions I have been asked with regard to electric cooking, it is clear that ladies are extremely interested in the subject, and I feel confident now that the bogy of cost is rapidly disappearing that the electric oven will soon become a household article.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

GRENADA.—The following goods are admitted free of duty:—Any articles for the use of His Majesty's service or for the use of the Government, and machinery or appliances considered by the Governor-in-Council to be useful for the development of local manufactures or products, or to be imported for the development of any business or manufacture carried on by, or belonging to, the importer.

The following duties are payable:—

Carriages and other vehicles on springs	10% ad val.
Earthenware (not being porous and unglazed) and glassware	10% „
Iron and steel, whether partly or wholly manufactured	10% „
Goods not specially mentioned in the tariff ...	7½% „

The value of imported goods for the purpose of calculating duty is the true invoice price, excluding freight, insurance and other charges.

N.B.—No person may install, erect, maintain or use in the Colony, any apparatus or instrument for the purpose of wireless telegraphy without a licence from the Governor.

NEW PATENTS APPLIED FOR, 1909.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

23,161. "Improvements in gas controllers, electric time switches and other timing devices." G. O. H. Horstmann, E. H. Horstmann, A. Horstmann, S. A. Horstmann and W. T. Edgar. October 11th.

23,177. "Improvements in magnetic ignition apparatus." R. J. Isaacson. October 11th. (Complete.)

23,179. "Improvements in or relating to electrical transmission and distribution systems." A. F. Berry. October 11th.

23,217. "Improvements in and relating to the control of electric motors." H. C. Leake. October 11th.

23,224. "Improvements in make and break switches." J. Wilson. October 11th.

23,225. "Improvements in insulating compounds and processes of making the same." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 11th.

23,227. "Improvements in electric cut-outs." T. E. Murray. (Date applied for under Sec. 91 of the Act, October 17th, 1908, being date of application in United States.) October 11th. (Complete.)

23,228. "Improvements in electric cut-outs." T. E. Murray. (Date applied for under Sec. 91 of the Act, November 9th, 1908, being date of application in United States.) October 11th. (Complete.)

23,229. "Improvements in electric cut-outs." T. E. Murray. (Date applied for under Sec. 91 of the Act, November 30th, 1908, being date of application in United States.) October 11th. (Complete.)

23,247. "Double-pole spark plug for use with internal combustion engines and the like." C. H. Naylor. October 12th.

23,269. "Improvements in mouthpieces for telephone transmitters." M. S. Hufschmidt and V. F. Wagner. (Date applied for under Sec. 91 of the Act, November 10th, 1908, being date of application in United States.) October 12th. (Complete.)

23,291. "Improved arrangement for the prevention of brush sparking in rotary electric frequency transformers having commutators." Siemens Bros. Dynamo Works, Ltd. (Siemens-Schuckertwerke G.m.b.H., Germany.) October 12th. (Complete.)

23,307. "Combination of an electric cable jointer's hand-cart and an electric cable drum." Callender's Cable and Construction Co., Ltd., and T. Petersen. October 12th.

23,310. "Improvements in telephone exchanges." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) (Application for Patent of Addition to No. 14,239, 1909.) October 12th. (Complete.)

23,319. "Improved arrangement of a combined collector, ring, commutator, and switches, for use with a small battery to start petroleum engines fitted with magneto starting apparatus." A. S. J. Chapman. October 12th.

23,323. "Improvements in machines for manufacturing electric-welded wire chains." C. L. Graves. October 12th. (Complete.)

23,324. "Improvements in and relating to telegraph bulletin printers." H. W. Lake. (Electric Press Bulletin Co., United States.) October 12th. (Complete.)

23,328. "Improvements in and relating to telegraph transmitting apparatus." H. W. Lake. (Electric Press Bulletin Co., United States.) October 12th. (Complete.)

23,379. "Improved detector for use in radio-telegraphy or telephony." W. T. Ditcham. October 13th.

23,384. "Combined lampholder and wall plug for use in connection with electrical fittings." A. W. Maconochie and T. H. Carey. October 13th.

23,397. "Improvements in or relating to current-collectors or trolley-heads for electric traction systems." E. M. Munro and Railless Electric Traction Co., Ltd. October 13th.

23,404. "Improvements in electricity meters." F. Becker. (Date applied for under Sec. 91 of the Act, October 15th, 1908, being date of application in Germany.) October 13th. (Complete.)

23,415. "Improvements in and relating to the voltage regulation of alternating electric current distribution systems." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 13th.

23,416. "Improvements in and relating to the voltage regulation of alternating current circuits." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 13th.

23,421. "Improvements in or relating to the manufacture of a composition of matter intended particularly for electric insulating purposes." F. Walton. October 13th.

23,429. "Improvements in electric telegraphy." A. Muirhead and Muirhead & Co., Ltd. October 13th.

23,459. "Improved attachment for preventing the breakage of the conductors in the flexible leads used with electric irons." E. T. Pick and W. Robb. October 14th.

23,466. "Electric bell piano." A. Hodgkins. October 14th.

23,494. "Improvements in field and telegraphic signalling and recording." B. S. Weston. October 14th.

23,500. "Improvements in and relating to incandescent electric lamps having filaments of refractory metal." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 14th.

23,502. "Improvements in or relating to electric prepayment meters." Electric Prepayment Meters, Ltd., and E. Schattner. October 14th.

23,504. "Improvements in trolleys for use in electric tramways on the overhead system." E. J. Fredericks, D. R. Fredericks, L. E. Russell, C. W. Wedding and J. Connelly. October 14th.

23,506. "Improved burglar electric alarm." A. S. Newman. October 14th.

23,526. "Improvements in electrical switches of the push-button type." Firm Watt-Installationen fur Stark-und-Schwachstrom Carl Schulz. (Date applied for under Sec. 91 of the Act, October 16th, 1908, being date of application in Germany.) October 14th. (Complete.)

23,541. "Improved connecting device or terminal for electrical conductors." A. H. Robinson. October 14th.

23,553. "Improvements in or relating to windings for alternating-current motors." M. Stern. (Application for Patent of Addition to No. 12,326/08.) (Date applied for under Sec. 91 of the Act, October 15th, 1908, being date of application in Germany.) October 14th. (Complete.)

23,582. "Improvements in alternating current transformers for conversion of polyphase currents to single-phase currents." C. L. Roberts. October 15th.

23,601. "Improved electrical burglar or other alarm or indicator." J. Wright and T. Douglas. October 15th.

23,619. "Improved governor for use with electric motors." H. C. E. Jacoby. (Date applied for under Rule 13, December 23rd, 1908. An invention comprised in application No. 27,967, dated December 23rd, 1908.) October 15th.

23,628. "Improved detector of electromagnetic waves." A. G. Rossi. October 15th. (Complete.)

23,649. "Improvements in and relating to electric transformers." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 15th.

23,650. "Improvements in and relating to dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 15th.

23,670. "Rigid suspended plate-handling electric crane." B. Wrightson Head. October 15th.

23,704. "Starting device for electric motors." W. N. Stewart and E. Foss. October 16th.

23,719. "Improvements in and relating to electric circuit closing devices." A. J. Boult. (Acme Automatic Street Indicating Co., United States.) October 16th. (Complete.)

23,742. "Improvements in devices for the automatic counting and recording of telephone calls." J. Kiessler. October 16th. (Complete.)

23,747. "Improvements relating to electric signalling means." E. A. Graham. October 16th. (Complete.)

23,756. "Improvements in dynamo-electric machines." H. Lippelt. (Date applied for under Sec. 91 of the Act, October 16th, 1908, being date of application in Germany.) October 16th. (Complete.)

23,759. "Improvements in sound-augmenting devices for use in telephony." S. G. Brown. October 16th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1908.

Inductor Coils and Transformer Apparatus. H. F. Bigge, F. R. Butt and J. H. Webb. 19,885. September 22nd.

Time-Element Devices, applicable to Electric Circuit Breakers and other Apparatus. J. G. Statter. 20,468. September 29th.

Brake Blocks, Electric Collector Shoes, and the like. J. Taylor. 20,472. September 29th.

Control of Electric Motors. J. G. V. Lang and Johnson-Lundell Electric Traction Co. 20,721. October 1st.

Electrolytic Decomposition of Sodium and other Chlorides in the Manufacture of Caustic Soda and other Useful Products. R. J. Levy. 20,787. October 2nd.

Electrically-driven Trains, especially Applicable to Trackless Trains. F. Wagner. 21,490. October 10th. (Application for Patent of Addition to No. 4,687, of 1908.)

Protective Devices for Electric Distribution Systems of the type known as Lightning Arresters. British Thomson-Houston Co. (General Electric Co.) 22,134. October 19th.

Sheathing of Electrical Wires. J. J. Rawlings, H. W. Handcock and A. H. Dykes. 24,348. November 12th.

Electric Automatic Call Boards for Controlling Time Signals and Apparatus connected therewith. J. Appleby and A. E. Drew. 24,618 November 16th.

Regulation of the Power Factor in Systems of Alternating Electric Current Distribution. British Thomson-Houston Co. (General Electric Co., U.S.) 25,556. November 21st.

Electric Clocks. T. J. Murday. 26,239. December 4th.

Improvements in, and in the Production of, Tilting Shade Holders or Carriers for Electric Lamps. M. Lawton and H. Whatson. 27,816. December 22nd.

Electric Batteries. A. J. Boult. (T. McNaughton.) 28,285. December 28th.

Electric Self-Winding Clocks. A. J. Boult. (H. O. Jackson and T. McNaughton.) 28,286. December 28th.

Electric Secondary Clocks. A. J. Boult. (H. O. Jackson and T. McNaughton.) 28,287. December 28th.

Voltmeters, Ammeters, Wattmeters, and like Electrical Indicating and Recording Apparatus. W. O. Smith and W. Phillips. 28,522. December 31st.

1909.

Apparatus for the Production of Electric Impulse Charges for the Purpose of Wireless Telegraphy. S. Eisenstein. 17,217. July 23rd. (Application for Patent of Addition to No. 10,019 of 1908.)

Dynamo-Electric Machines. A. Boeckel, O. Grünberg, J. K. Krukovski and E. Luxembourg. 72. January 1st. (Date applied for under Rule 13, September 24th, 1908.)

Electric Furnace. Aktiebolaget Elektrimetall. 4,553. February 24th. (Date applied for under International Convention, March 10th, 1908.)

Locking Device for Electric Switch-Boxes. C. Wustet Cie. 4,561. February 24th. (Date applied for under International Convention, April 15th, 1908.)

Protective Devices for Alternating Current. Allgemeine Elektricitäts Ges. 5,717. March 9th. (Date applied for under International Convention, March 12th, 1908.)

Electrical Heating Device. G. Cooper, F. C. Sharp and T. A. Stevens. 12,562. May 27th.

Suspension Devices for Supplying Electric Current from Overhead Wires to Arc Lamps and other Apparatus. A. Schweiger. 13,661. June 10th.

Electric Contact-Breakers particularly Applicable for Induction or Sparking Coils. R. W. Grant. 14,117. June 16th.

Regulation of Alternators Running in Parallel. Allgemeine Elektricitäts Ges. 17,199. July 23rd. (Date applied for under International Convention, July 23rd, 1908.)

Telephone Systems. E. W. Smith. 2,151. January 29th. (Application for Patent of Addition to No. 22,638, 1907.)

Electric Apparatus for Controlling the Operation of a Number of Machines or other Devices from a Distant Point. C. Wirth and C. Beck. 5,811. March 10th. (Date applied for under International Convention, March 11th, 1908.)

Machines for Covering Wire or other Electric Conductors with Insulating Material. H. L. Owen. 7,531. March 29th.

Aerial Electric Cut-outs, Electrical Bridge Couplings, and the like. E. Wechmar. 9,803. April 24th.

Device for Starting and Cutting-out Electric Motors. Zucker Fabrik Frankenthal. 12,268. May 24th. (Date applied for under International Convention, June 1st, 1908.)